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**CATALOGUE**  
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**1800—1900**

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**SUBJECT INDEX**

**VOLUME III**

**PHYSICS**

**PART I**

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ROYAL SOCIETY OF LONDON

CATALOGUE  
OF  
SCIENTIFIC PAPERS  
1800–1900

SUBJECT INDEX

VOLUME III

PHYSICS

PART I

GENERALITIES, HEAT, LIGHT, SOUND

CAMBRIDGE:  
AT THE UNIVERSITY PRESS  
1912

ARRANGED FOR A COMMITTEE OF THE ROYAL SOCIETY  
UNDER THE SUPERINTENDENCE OF

**HERBERT M<sup>c</sup>LEOD, LL.D., F.R.S.**

DIRECTOR OF THE CATALOGUE

with the assistance of

**ALICE EVERETT, M.A., R. HARGREAVES, M.A.,  
AND W. MARSHALL WATTS, D.Sc.**





## Preface

undertook the section on Heat, Dr W. Marshall Watts that on Light and Miss Alice Everett that on Sound.

The subjects are arranged under the registration numbers adopted in the International Catalogue of Scientific Literature ; a copy of Schedule C (Physics) of that Catalogue, as revised in 1905, is prefixed to the Index, with indication of the pages on which the titles for the different sections occur. It has occasionally been found convenient, in order to save repetition in printing, to group entries under a sub-heading which is not contained in the International Catalogue Schedule. Where this has been done the sub-heading is printed in italics. In some of these cases the words of the sub-heading are understood to exist before the entries following them, and consequently these entries commence with small letters. These minor classifications, being often made mechanically on the basis of the explicit mention of the sub-heading, are not to be taken as exhaustive ; cognate entries may be found elsewhere under the same main heading. The unit of classification is thus the complete numbered heading.

At the end of the volume will be found an alphabetical index to the subdivisions under which the subject titles have been arranged ; this will much facilitate reference. The index also contains references to important subjects included within some of the subdivisions but without separate headings.

The entries in the Index are arranged so that reference can be made, if necessary, to the complete titles in the Catalogue of Scientific Papers. Generally the author's name together with the date will indicate the volume in which the title of the paper may be found in full. But these clues are insufficient when the paper is anonymous, or occurs in Volume XII or in the additions to Volume VI. They are also at fault for titles marked with an asterisk showing that they belong to previous volumes ; in these cases the number of the volume is given in the Index entry in small Roman numerals within brackets. The references have been made as short as possible ; thus the number of only the initial page of each paper has been given ; but the length of the paper may be found by reference to the Catalogue of Authors.

When an error has been found in an author's name in the Catalogue, it is corrected in the Index and a reference made to the error.

The Index contains references to some papers, of dates earlier than 1884, which were omitted in previous volumes of the Catalogue ; these are indicated

## Preface

by an asterisk placed before the date. The full titles of these papers will be given in the continuation of the Catalogue of Authors.

When an author's personal name does not appear in the original heading of a paper, no attempt has been made to find the name for the Index; but this will be done for the Catalogue of Authors.

Entries on the same subject are arranged, so far as possible, in order of date irrespective of the authors' names, with the endeavour to present the subject in the historical form. This grouping of the entries, involving modifications of titles prepared by different Referees, or by the same Referee at different times, has been one of the most difficult problems in the preparation of the Index.

The abbreviations used in the Royal Society Catalogue for the names of the serials have been further shortened for the Index. As the abbreviations are not uniform in all the volumes, it will be found that the same journal may be indicated by several different abbreviations; but in each case the one selected is that which was used in the volume in which the title of the paper occurs.

In the case of serials commencing since 1883, the abbreviations adopted in the International Catalogue have been used as a guide.

The list of serials will, as in the case of Pure Mathematics, be a valuable feature of the Index. It contains the names of 1261 serials from which the entries in the Index have been taken. Each title is preceded by the abbreviation which represents the serial in the Index; the date of commencement of the serial is given, and if it is extinct the date of the last volume is added. There are appended symbols representing the names of thirty British Libraries in some of which the serials may be found; where the set is incomplete the symbol is followed by *i*. The information from which this list has been compiled was obtained, in the first instance, from published catalogues; subsequently the list was submitted to the custodians of many of the libraries, who kindly marked many serials which had not been found in the catalogues used. The thanks of the Committee for this valuable assistance are due to Mr F. Jenkinson of the Cambridge University Library, the late Mr E. W. B. Nicholson and Mr F. Madan of the Bodleian Library, the Librarian of the Radcliffe Library, the Librarian of the Cambridge Philosophical Society, Mr F. W. Clifford of the Chemical Society, to Mr R. Lloyd Praeger for obtaining information from the five Libraries in Dublin,

## Preface

Mr J. Hardy of the Royal Society of Edinburgh, Mr C. V. Crook of the Geological Museum, Mr Rupert Jones of the Geological Society, Mr J. Knight of the Royal Philosophical Society, Glasgow, Mr F. C. Nicholson of the University, Glasgow, Dr J. H. T. Tudsbery of the Institution of Civil Engineers, Dr B. Daydon Jackson, and Mr A. W. Kappel of the Linnean Society, the Librarian of the London Mathematical Society, Mr J. W. Knapman of the Pharmaceutical Society, Mr E. W. Hulme of the Patent Office Library, Mr W. H. Wesley of the Royal Astronomical Society, Mr F. Allen of the Royal Geographical Society, Mr R. W. Chambers of University College, London, Mr L. W. Fulcher of the Science Library, Science Museum, South Kensington, Dr W. N. Shaw, F.R.S., Director of the Meteorological Office, and Mr V. G. Plarr, Librarian of the Royal College of Surgeons.

Although much care has been expended in making this list as accurate as possible, it is probable that some errors will still be found, and the Director will be thankful to any one who will send corrections: portions of the list will be required for the subsequent volumes of the Index.

The following Referees have assisted at various times in the preparation of the Subject Index in Physics: Miss Alice Everett, Miss Burna Pool, Mr R. J. Dallas, Mr W. A. Davis, Mr R. Hargreaves, Dr R. A. Lehfeldt, Mr W. Lowson, Mr H. E. Schmitz, Mr J. H. Shaxby and Dr W. Marshall Watts. The Committee is indebted to them for much valuable help.

Dr W. Marshall Watts has given special assistance and supervision in the preparation of the Index titles. To him, and to Miss Bremner and the other members of the Catalogue Staff of the Royal Society, thanks are due for careful and conscientious work.

The Committee is indebted to the authorities of the British Museum, of the Natural History Museum, of the Royal College of Surgeons, of the Patent Office and of the Meteorological Office for facilities given to the type writers and revisers of the Catalogue staff in copying titles of papers from the books in the libraries, and also to the Cambridge University Library, the Chemical Society, the Geological Society, the Linnean Society, the Royal Astronomical Society, the Royal Geographical Society and the Alpine Club for the loan of books for the preparation of the Catalogue.

Besides these Libraries others have been consulted and the Committee gratefully acknowledges the assistance that has been received.

## Preface

The Committee desires to renew the record of its gratitude to the late Dr Ludwig Mond, F.R.S., for his generosity in providing funds for carrying on the work of the Catalogue, in which he took so keen an interest. Without his help it would hardly have been possible to proceed with the Catalogue in its present complete form; by his decease the members of the Committee have been deprived of a stimulating colleague who had been active in the planning of the work almost from the beginning.

The final section of the Catalogue of Scientific Papers arranged according to Authors' names, that for the period 1884 to 1900, is in active preparation. The material has now been all collected and it is hoped that the printing may soon be commenced.

The Syndics of the Cambridge University Press have undertaken the complete risk of printing and publishing, as regards both the Catalogue of Scientific Papers and the Subject Index. It will be the care of the Committee, and it is hoped of the Scientific world generally, to use their best endeavours that this public-spirited action shall not result in financial loss.

The thanks of the Committee are due to the officials of the Cambridge Press for their unfailing courtesy in the discharge of a complex task.

October, 1912.

*als*

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## SUBJECT INDEX OF PHYSICS

### LIST OF SERIAL PUBLICATIONS

WITH THE ABBREVIATIONS OF THEIR TITLES USED IN THE INDEX, AND  
LIBRARIES WHERE THE SERIALS CAN BE CONSULTED.

The date following the title of a serial indicates the year of publication of the first volume; if a second date is given it marks the termination of the serial.

The letters following the dates indicate libraries where the serials are to be found: if the serial is incomplete, the symbol of the library is followed by *i*.

B.M.	British Museum.	Linn.S.	Linnean Society.
Camb.P.S.	Cambridge Philosophical Library.	Math.S.	Mathematical Society.
Camb.U.	Cambridge University Library.	M.O.	Meteorological Office, South Kensington.
Chem.S.	Chemical Society.	N.H.M.	Natural History Museum.
Dub.N.L.I.	National Library of Ireland, Dublin.	Oxon.B.	Bodleian, Oxford.
Dub.R.C.S.	Royal College of Science, Dublin.	Oxon.B.(R.)	Deposited in Radcliffe.
Dub.R.D.S.	Royal Dublin Society.	Oxon.R.	Radcliffe, Oxford.
Dub.R.I.A.	Royal Irish Academy, Dublin.	Pharm.S.	Pharmaceutical Society, London.
Dub.T.C.	Trinity College, Dublin.	P.O.	Patent Office, London.
Edinb.R.S.	Royal Society of Edinburgh.	R.A.S.	Royal Astronomical Society.
Edinb.U.	Edinburgh University.	R.C.Surg.	Royal College of Surgeons.
Geol.M.	Geological Survey Museum, Jermyn St.	R.Geogr.S.	Royal Geographical Society.
Geol.S.	Geological Society.	R.S.	Royal Society.
Glasg.P.S.	Royal Philosophical Society of Glasgow.	S.K.	Science Museum Library, South Kensington.
Glasg.U.	Glasgow University.	U.C.L.	University College, London.
I.CE.	Institution of Civil Engineers, London.		
<b>A. Aga.</b>	Annales Agronomiques.... Paris. 1851; 1875—	B.M.; Chem.S. <i>i</i> ;	Linn.S.; Oxon.B.; P.O. <i>i</i> ; R.S. <i>i</i> .
<b>Aarau Arch. Md.</b>	Archiv der Medizin, Chirurgie, und Pharmacie. Aarau. 1816—17.	R.S.	
<b>Aarau Mt.</b>	Mittheilungen der Aargauischen Naturforschenden Gesellschaft. Aarau. 1878—	N.H.M.; R.S.; S.K.	
<b>A. C.</b>	Annales de Chimie [et de Physique], ou Recueil de Mémoires concernant la Chimie et les Arts qui en dépendent. Paris. 1789—	B.M.; Camb.U.; Chem.S.; Dub.R.D.S. <i>i</i> ;	Dub.T.C. <i>i</i> ; Edinb.R.S.; Edinb.U.; Glasg.U.; I.CE.; N.H.M.; Oxon.B. <i>i</i> (R.); Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.
<b>A. C. Anal.</b>	Annales de Chimie Analytique appliquée à l'Industrie, à l'Agriculture, à la Pharmacie et à la Biologie. Paris. 1896—	Chem.S. <i>i</i> ; P.O.	
<b>Ac. Cæs. Leop. N. Acta</b>	Nova Acta physico-medica Academicæ Cæs. Leopoldino-Carolinæ Naturæ Curiosorum. Erlangen, Bonn, Breslau. 1758—	Camb.P.S.; Camb.U.; Chem.S. <i>i</i> ;	Dub.T.C.; Edinb.R.S. <i>i</i> ; Edinb.U.; Geol.S. <i>i</i> ; Glasg.U.; Linn.S. <i>i</i> ;
		N.H.M.; Oxon.R.; Pharm.S. <i>i</i> ;	R.A.S. <i>i</i> ; R.C.Surg.; R.S.; S.K. <i>i</i> ; U.C.L. <i>i</i> .
		<i>See Ac. Mt. C. N. Acta and Cæs. Leop. Ac. N. Acta.</i>	
<b>Acireale Ac. At.</b>	Atti e Rendiconti dell' Accademia di Scienze, Lettere e Arti dei Zelanti e PP. dello Studio di Acireale. Acireale. 1890—	Camb.P.S. <i>i</i> ;	Geol.S. <i>i</i> ; N.H.M. <i>i</i> ; R.S. <i>i</i> .

## List of Serial Publications

- Ac. Mt. C. N. Acta** ... *See Ac. Cas. Leop. N. Acta and Cas. Leop. Ac. N. Acta.*
- A. Cond. Pon. Chauss.** ... Annales des Conducteurs des Ponts et Chaussées; Recueil de Mémoires, etc., concernant le Service de Conducteurs des Ponts et Chaussées. Paris.  
1857— I.CE.i.; P.O.
- A. Cons. Arts et Mét.** ... Annales du Conservatoire des Arts et Métiers. Paris.  
1861— B.M.; Camb.U.; Glasg.P.S.i.; I.CE.i.; Oxon.B.; P.O.; R.S.; S.K.i.  
*See Par. A. Cons.*
- A. C. Phm.** ... Annalen der Chemie und Pharmacie. Lemgo, Leipzig, Heidelberg.  
1832— B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Dub.R.C.S.i.; Edinb.R.S.i.; Edinb.U.; Glasg.P.S.; Glasg.U.i.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.  
*See Lieb. A.*
- Acta Math.** ... Acta Mathematica. Stockholm.  
1882— B.M.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Glasg.U.; Math.S.; Oxon.R.; R.A.S.; R.S.; U.C.L.
- Act. S. Helv.** ... Actes de la Société Helvétique des Sciences Naturelles. Lausanne, etc.  
1825— B.M.i.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; S.K.  
*See At. S. Elvet., Sch. Gs. Vh. and Sch. Nl. Gs. Vh.*
- A. das Sc.** ... Annaes das Sciencias, etc. por huma Sociedade de Portuguezes residentes em Paris. Paris.  
1818—27. B.M.; Camb.U.i.  
*See Par. A. das Sc.*
- A. der Hydrog.** ... Annalen der Hydrographie und Maritimen Meteorologie. Herausgegeben von der Deutschen Seewarte in Hamburg. Berlin.  
1875— [Continuation of: Hydrographische Mittheilungen, 1873—74.] B.M.; M.O.; P.O.i.; R.Geogr.S.
- A. di C.** ... Annali di Chimica. Milano.  
1845—97. [Continued as: Annali di Farmacoterapia e Chimica, 1898—] B.M.; Camb.U.i.; Chem.S.i.; Pharm.S.i.; P.O.i.  
*See Foll. A.*
- A. di Fm. e C.** ... Annali di Farmacoterapia e Chimica. Milano, Bologna, etc.  
1898— [Continuation of: Annali di Chimica, 1845—97.] B.M.; Camb.U.i.; Chem.S.; Glasg.P.S.i.; P.O.
- A. d'Ocul.** ... Annales d'Oculistique. Charleroi, Bruxelles, Paris.  
1838— B.M.; Camb.U.i.; Oxon.R.i.; R.C.Surg.
- Aér.** ... L'Aéronaute. Bulletin Mensuel Illustré de la Navigation Aérienne. Paris.  
1868— B.M.i.; P.O.; S.K.
- Aer. J.** ... The Aeronautical Journal. London.  
1897— B.M.; Camb.U.i.; I.CE.i.; P.O.; R.S.; S.K.
- Aér. S. Ep.** ... Annual Reports of the Aeronautical Society of Great Britain. London.  
1866—93. I.CE.i.; Oxon.B.; P.O.
- A. Gén. Civ.** ... Annales du Génie Civil; Recueil de Mémoires sur les Mathématiques pures et appliquées; l'Astronomie, la Chimie, la Physique, etc. Paris.  
1862—80. B.M.; Camb.U.; Dub.R.C.S.i.; I.CE.; P.O.
- A. Gén. Sc. Ph.** ... Annales générales des Sciences Physiques. Bruxelles.  
1819—21. Camb.U.; Glasg.U.; N.H.M.; R.C.Surg.; R.S.
- Ag. S. J.** ... Journal of the Royal Agricultural Society of England. London.  
1840— B.M.; Camb.U.; Chem.S.; Dub.T.C.; Geol.M.; Geol.S.; Glasg.U.i.; I.CE.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- A. Hydrog.** ... Annales Hydrographiques. Recueil d'Avis, Instructions, Documents, et Mémoires relatifs à l'Hydrographie et à la Navigation. Paris.  
1849— B.M.; Edinb.R.S.i.; M.O.i.; Oxon.B.; R.A.S.i.; R.Geogr.S.i.; R.S.i.
- A. Hyg. Pbl.** ... Annales d'Hygiène publique [et de Médecine légale]. Paris.  
1829— B.M.; Camb.U.; Edinb.R.S.i.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; Oxon.R.; P.O.i.; R.C.Surg.
- Aix Ac. Mm.** ... Mémoires de l'Académie des Sciences, Agriculture, Arts et Belles-Lettres. Aix.
- Aix Mm.** ...
- Aix Mm. Ac.** ... 1819— B.M.; Dub.R.I.A.; N.H.M.i.; Oxon.B.i.; R.S.i.
- Alb. I. T.** ... Transactions of the Albany Institute. Albany.  
1830— B.M.; N.H.M.; R.S.; S.K.i.

## List of Serial Publications

- Al. D. Mt. Stg.** ..... Allgemeine Deutsche Naturhistorische Zeitung. Dresden, Leipzig, Hamburg.  
1846—47; 1855—57. B.M.; Glasg.P.S.i.; N.H.M.; R.S.; S.K.i.
- AlHer Bul. S. Ém.** ..... Bulletin de la Société d'Émulation du Département de l'Allier: Sciences, Arts, et Belles-Lettres. Moulins.  
1846—64. B.M.; Glasg.P.S.i.; Oxon.B.; R.S.
- A. Lndw.** ..... Annalen der Landwirtschaft in den K. Preuss. Staaten; herausg. vom Präsidium des K. Landes-Oecon.-Collegiums. Berlin.  
1843—71. [Continued as: Landwirthschaftliche Jahrbücher, 1872—.] P.O.
- Am. Ac. Mm.** ..... Memoirs of the American Academy of Arts and Sciences. Cambridge, Boston.  
1785— B.M.i.; Camb.P.S.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Geol.S.i.; I.CE.i.; Linn.S.; N.H.M.; Oxon.R.; P.O.i.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.  
*See Bost. Am. Ac. Mm.*
- Am. Ac. P.** ..... Proceedings of the American Academy of Arts and Sciences. Boston.  
1846— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.; Edinb.R.S.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; Linn.S.; Math.S.i.; N.H.M.; Oxon.R.; P.O.; R.A.S.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Am. As. P.** ..... Proceedings of the American Association for the Advancement of Science. Washington, Salem.  
1848— B.M.i.; Camb.P.S.i.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.
- Am. C.** ..... The American Chemist, a monthly Journal of theoretical Chemistry. New York.  
1871—77. Chem.S.i.; N.H.M.; P.O.; Pharm.S.i.; S.K.i.
- Am. C. J.** ..... American Chemical Journal. Baltimore.  
1879— Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.i.; Glasg.P.S.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.; R.S.; S.K.
- A. Microgr.** ..... Annales de Micrographie, spécialement consacrées à la Bactériologie, aux Protophytes et aux Protozoaires. Paris.  
1888—98. Glasg.P.S.i.; Glasg.U.; N.H.M.; Oxon.R.
- Am. C. S. J.** ..... The Journal of the American Chemical Society. New York, Easton, Pa.  
1879— B.M.; Camb.P.S.; Chem.S.; Edinb.U.i.; Glasg.U.i.; N.H.M.; Pharm.S.; P.O.; S.K.; U.C.L.i.
- Am. Eng. & Railroad J.** ..... American Engineer and Railroad Journal. New York.  
1893— [Continuation of: The Railroad and Engineering Journal, 1887—92.] B.M.; I.CE.; P.O.
- Amici G. Tosc.** ..... Giornale Toscano di Scienze Mediche, Fisiche, e Naturali; Amici, Bufalini, etc. Pisa.  
1840—43. B.M.; Camb.U.i.; Glasg.P.S.i.; Oxon.B.
- Amiens Ac. Mm.** ..... Mémoires de l'Académie des Sciences, Agriculture, Commerce, Belles-Lettres, et Arts du département de la Somme. Amiens.  
**Amiens Mm.** .....  
**Amiens Mm. Ac.** .....  
**Amiens Mm. Ac. Sc.** .....  
1835— B.M.; Camb.U.; Dub.T.C.i.; N.H.M.i.; Oxon.B.i.; R.S.i.
- Am. I. Mn. E. T.** ..... Transactions of the American Institute of Mining Engineers. Philadelphia, Easton, New York.  
1871— Geol.S.; I.CE.; P.O.; S.K.
- A. Mines** ..... Annales des Mines, ou Recueil des Mémoires sur l'exploitation des Mines, et sur les Sciences et les Arts qui s'y rapportent. Paris.  
1817— [Continuation of: Journal des Mines, etc., 1794—1815.] B.M.; Camb.U.; Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.; N.H.M.; Oxon.B.(R.); P.O.; R.S.; S.K.
- Am. I. T.** ..... [Reports and Transactions] of the American Institute of the City of New York. Albany.  
1841— B.M.i.; I.CE.i.; P.O.i.; R.S.i.
- Am. J. Med. Sc.** ..... American Journal of the Medical Sciences. Philadelphia.  
1827— B.M.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.; Oxon.R.; R.C.Surg.; U.C.L.i.
- Am. J. Meth.** ..... American Journal of Mathematics. Baltimore.  
1878— B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.I.A.;



## List of Serial Publications

- Dub.T.C.; Edinb.R.S.; Edinb.U.; Glasg.U.i.; I.CE.i.; Math.S.; Oxon.B.; Oxon.R.; R.A.S.; R.S.; S.K.; U.C.L.
- Am. J. Ot.**..... The American Journal of Otology. New York.  
1879—82. Glasg.P.S.i.; R.S.
- Am. J. Phm.**..... American Journal of Pharmacy; published by the Philadelphia College of Pharmacy. Philadelphia.  
1836— [Continuation of: Journal of the Philadelphia College of Pharmacy, 1830—35.] Chem.S.i.; Pharm.S.; P.O.i.; R.C.Surg.i.
- Am. J. Psychol.**..... The American Journal of Psychology. Baltimore, Worcester, Mass.  
1888— B.M.; Edinb.U.; Oxon.B.; Oxon.R.; U.C.L.i.
- Am. J. Sc.**..... The American Journal of Science and Arts; Silliman. New Haven.  
1818— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.N.L.I.i.; Dub.R.C.S.i.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.  
*See Silliman J.*
- Am. Micr. J.**..... The American Monthly Microscopical Journal. New York.  
1890— Camb.U.; Dub.N.L.I.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.
- Am. Micr. S. P.**..... Proceedings of the American Microscopical Society. Washington, Ithaca, N.Y.  
1892—94. [Continuation of: Proceedings of the American Society of Microscopists, 1878—91.] [Continued as: Transactions of the American Microscopical Society, 1895—.] Linn.S.; N.H.M.
- Am. Micr. S. T.**..... Transactions of the American Microscopical Society. Lincoln, Buffalo.  
1895— [Continuation of: Proceedings, etc., 1892—94.] Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.
- Am. Md. Ph. Reg.**..... The American Medical and Philosophical Register or Annals of Medicine, Natural History, Agriculture and the Arts. New York.  
1810—14. B.M.; Edinb.U.i.; Geol.S.; R.C.Surg.; R.S.; U.C.L.
- Am. Met. J.**..... American Meteorological Journal. Detroit.  
1884—96. B.M.i.; M.O.
- Am. Nat.**..... The American Naturalist. An illustrated magazine of Natural History. Philadelphia, Boston.
- Am. Natlist.**..... 1868— B.M.; Camb.P.S.i.; Camb.U.; Edinb.R.S.i.; Edinb.U.i.; Geol.M.i.; Linn.S.i.; N.H.M.; Oxon.R.; R.Geogr.S.i.; R.S.i.; S.K.
- Am. Oph. S. T.**..... Transactions of the American Ophthalmological Society. New York, Boston, Hartford.  
1865— Glasg.P.S.i.; Oxon.R.; R.C.Surg.
- Am. Phm. As. P.**..... Proceedings of the American Pharmaceutical Association. Philadelphia.  
1853— Pharm.S.
- Am. Ph. S. P.**..... Proceedings of the American Philosophical Society. Philadelphia.  
1840— Camb.P.S.; Camb.U.i.; Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; Math.S.i.; M.O.; N.H.M.i.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Am. Ph. S. T.**..... Transactions of the American Philosophical Society. Philadelphia.  
1771— B.M.i.; Camb.P.S.; Camb.U.i.; Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Geol.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; N.H.M.i.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.  
*See Philad. T.*
- Am. Pol. J.**..... The American Polytechnic Journal. Washington.  
1853—54. B.M.; P.O.
- Am. S. CE. T.**..... Transactions of the American Society of Civil Engineers. New York.  
1871— I.CE.; P.O.; S.K.i.; U.C.L.i.
- Am. S. Micr. P.**..... Proceedings of the American Society of Microscopists. Indianapolis, etc.  
1878—91. [Continued as: Proceedings of the American Microscopical Society, 1892—94.] Linn.S.; N.H.M.
- Amst. Ak. Jb.**..... Jaarboek van de Koninklijke Akademie van Wetenschappen gevestigd te Amsterdam. Amsterdam.  
1857— B.M.; Camb.P.S.; Dub.R.D.S.; Dub.T.C.; Edinb.R.S.i.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.; N.H.M.; R.A.S.i.; R.Geogr.S.; R.S.; U.C.L.i.  
*See Amst. Jb.*

## List of Serial Publications

- Amst. Ak. F.** ..... Koninklijke Akademie van Wetenschappen te Amsterdam. Proceedings of the Section of Sciences. Amsterdam. 1899— Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Glasg.P.S.; Glasg.U.; Oxon.B.; R.A.S.; R.Geogr.S.; R.S.; S.K.
- Amst. Ak. Vh.** ..... Verhandelingen der Koninklijke Akademie van Wetenschappen. Amsterdam. 1854— Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; R.A.S.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.i.; U.C.L.i.
- Amst. Ak. Va.** ..... Verslagen der Zittingen van de Wis- en Natuurkundige Afdeeling der Koninklijke Akademie van Wetenschappen. 1893, 1894. [*Continuation of*: Verslagen en Mededeelingen, 1853—92.] Verslagen van de Zittingen der Wis- en Natuurkundige Afdeeling van de Koninklijke Akademie van Wetenschappen. 1895, 1896. Koninklijke Akademie van Wetenschappen te Amsterdam. Verslagen van de Gewone Vergaderingen der Wis- en Natuurkundige Afdeeling. Amsterdam. 1897— B.M.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.; Glasg.P.S.; Glasg.U.; N.H.M.; R.A.S.; R.Geogr.S.; R.S.; S.K.i.
- Amst. Ak. Va. M.** ..... Verslagen en Mededeelingen der Koninklijke Akademie van Wetenschappen. Afdeeling Natuurkunde. Amsterdam. 1853—92. [*Continued as*: Verslagen der Zittingen, etc., 1893—.] B.M.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.; Glasg.P.S.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.i.; R.A.S.i.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.  
*See Amst. Va. Ak.*
- Amst. Ak. Wet. F.** ..... Processen-Verbaal van de Gewone Vergaderingen der Koninklijke Akademie van Wetenschappen. Afdeeling Natuurkunde. Amsterdam. 1865—84. Dub.R.D.S.; Linn.S.i.; R.A.S.; R.S.
- Amst. I.** ..... Het Instituut. Amsterdam. 1841—46. B.M.; Edinb.R.S.i.; S.K.
- Amst. Jb.** ..... } *See Amst. Ak. Jb.*  
**Amst. Jb. Ak.** ..... }  
**Amst. N. Vh.** ..... } Nieuwe Verhandelingen der eerste Klasse van het Koninklijk Nederlandsche Instituut van Wetenschappen, Letterkunde, en Schoone Kunsten te Amsterdam. Amsterdam. 1827—52. [*Continuation of*: Verhandelingen, etc., 1812—25.] B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.; Glasg.U.i.; Linn.S.; N.H.M.; R.S.; S.K.
- Amst. Ta. Nt. Wet.** ..... Tijdschrift voor Natuurkundige Wetenschappen en Kunsten. Amsterdam. 1810—11. Camb.P.S.; R.S.
- Amst. Ta. Ws. Nt. Wet.** ..... Tijdschrift voor de Wis- en Natuurkundige Wetenschappen, Letterkunde, en Schoone Kunsten te Amsterdam. Amsterdam. 1847—52. B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Linn.S.; Oxon.B.; R.S.
- Amst. Vh.** ..... }  
**Amst. Vh. Ak.** ..... } Verhandelingen der Eerste Klasse van het Koninklijk Nederlandsche Instituut van Wetenschappen, Letterkunde, en Schoone Kunsten te Amsterdam. Amsterdam. 1812—25. [*Continued as*: Nieuwe Verhandelingen, etc., 1827—52.] B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.; Glasg.U.i.; N.H.M.; Oxon.B.; R.S.; S.K.
- Amst. Va. Ak.** ..... *See Amst. Ak. Va. M.*
- A. Mt.** ..... Annali di Matematica pura ed applicata...; Tortolini. Roma, Milano. 1858— B.M.; Camb.U.i.; Dub.R.D.S.; Dub.T.C.; Edinb.U.; Glasg.U.i.; Oxon.B.(R.); R.S.; U.C.L.  
*See Tortolini A.*
- A. Mth.** ..... Annals of Mathematics. University of Virginia. Charlottesville, Va. 1884— Camb.P.S.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.; Math.S.i.; Oxon.B.; S.K.i.
- Anal.** ..... The Analyst, including the Proceedings of the Society of Public Analysts. London. 1877— B.M.; Camb.U.i.; Chem.S.; Edinb.U.i.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.; Pharm.S.; P.O.; R.S.i.; U.C.L.i.
- Angers Ac. Sc. Mem.** ..... Mémoires de l'Académie des Sciences et Belles-Lettres d'Angers. Angers.

## List of Serial Publications

- 1890—95. [*Continuation of: Mémoires de la Société Académique de Maine et Loire, 1857—83.*] Glasg.P.S.i.; N.H.M.
- Angers S. Sc. Bul.** ..... Bulletin de la Société d'Études Scientifiques d'Angers. Angers.  
1872— B.M.; N.H.M.
- A. NH.** ..... Annals of Natural History, or Magazine of Zoology, Botany, and Geology. London.  
1838—40. [*Continuation of: Magazine of Zoology and Botany, 1837—88.*] [*Continued as: Annals and Magazine of Natural History, 1841—*] B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.i.; Geol.M.; Geol.S.i.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Anhalt Vh. Wt. Vr.** ..... Verhandlungen des naturhistorischen Vereins für Anhalt in Dessau. Dessau.  
1840—70.
- An. Mét. Fr.** ..... Annuaire Météorologique de la France. Paris.  
1849—52. [*Continued as: Annuaire de la Société Météorologique de France, 1853—*] B.M.; Camb.U.; Dub.T.C.; Glasg.U.i.; M.O.; R.S.  
*See Fr. An. Mét.*
- Anvers A. S. Méd.** ..... Annales de la Société de Médecine d'Anvers. Anvers.  
1841—56. Glasg.P.S.i.; R.S.
- Anvers J. Phm.** ..... Journal de Pharmacie. Publié par la Société de Pharmacie d'Anvers. Anvers.  
1845— B.M.; Oxon.R.; Pharm.S.i.
- Ap. I. J.** ..... The Journal of the Anthropological Institute of Great Britain and Ireland. London.  
1872— B.M.; Camb.P.S.i.; Camb.U.; Dub.N.L.I.; Edinb.R.S.; Edinb.U.; Glasg.U.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- A. Fon. Chauss.** ..... Annales des Ponts et Chaussées. Mémoires et documents relatifs à l'Art des Constructions et au Service de l'Ingénieur. Paris.  
1831— B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.; P.O.; R.S.i.  
*See Fr. A. Fon. Chauss.*
- A. Ph.** ..... Annalen der Physik; Drude. Leipzig.  
1900— [*Continuation of: Annalen der Physik und Chemie, 1824—99.*] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Edinb.R.S.; Edinb.U.; Glasg.P.S.; Glasg.U.; I.CE.; N.H.M.; Pharm.S.; P.O.; R.S.; S.K.; U.C.L.
- A. Ph. C.** ..... Annalen der Physik und Chemie; Poggendorff, Wiedemann. Leipzig.  
1824—99. [*Continuation of: Annalen der Physik; Gilbert, 1799—1824.*] [*Continued as: Annalen der Physik; Drude, 1900—*] B.M.; Camb.P.S.i.; Camb.U.; Chem.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.(R.); Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.  
*See Pogg. A.*
- A. Ph. C. Beibl.** ..... Beiblätter zu den Annalen... Leipzig.  
1877— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Glasg.U.; I.CE.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.S.; S.K.; U.C.L.
- Arch. An. Micr.** ..... Archives d'Anatomie Microscopique. Paris.  
1897— B.M.; Glasg.P.S.i.; Glasg.U.i.; N.H.M.; Oxon.R.
- Arch. An. Fl.** ..... Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin; Müller, Reichert, Du Bois-Reymond. Berlin.  
1834—76. [*Continuation of: Archiv für Anatomie und Physiologie, 1826—32.*] [*Continued as: Archiv für Anatomie und Physiologie, 1877—*] B.M.; Camb.U.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; N.H.M.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.  
*See Müller Arch. and Reichert Arch.*
- Am. S.** ..... Archiv für Anatomie und Physiologie. Anatomische Abtheilung. Archiv für Anatomie und Entwicklungsgeschichte. Leipzig.  
1877— [*Continuation of: Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin, 1834—76.*] Camb.P.S.; Camb.U.; Edinb.U.; Glasg.U.; N.H.M.i.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Amst. An. Fl. (An. Ab.)...** ..... Archiv für Anatomie und Physiologie. Anatomische Abtheilung. Archiv für Anatomie und Entwicklungsgeschichte. Leipzig.  
1877— [*Continuation of: Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin, 1834—76.*] Camb.P.S.; Camb.U.; Edinb.U.; Glasg.U.; N.H.M.i.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.

## List of Serial Publications

- Arch. An. Pl. (Pl. Ab.)** ... Archiv für Anatomie und Physiologie. Physiologische Abtheilung. Archiv für Physiologie. Leipzig.  
1877— [Continuation of: Archiv für Anatomie, Physiologie, und Wissenschaftliche Medizin, 1834—76.] Camb.P.S.; Camb.U.; Edinb.U.; Glasg.U.; N.H.M.i.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Arch. Augenh.** ..... Archiv für Augenheilkunde. Wiesbaden.  
1879— [Continuation of: Archiv für Augen- und Ohrenheilkunde, 1869—78.] B.M.; Camb.U.; Glasg.P.S.i.
- Arch. de l'Électr.** ..... Archives de l'Électricité; A. de la Rive. Genève.  
1841—45. B.M.; Camb.U.; P.O.; R.C.Surg.; R.S.i.
- Arch. de Pl.** ..... Archives de Physiologie normale et pathologique. Paris.  
1868—98. [Continuation of: Journal de la Physiologie, 1858—65.] [Continued as: Journal de Physiologie et de Pathologie Générale, 1899—] B.M.; Camb.U.; Edinb.U.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.; R.S.; U.C.L.
- Arch. f. Oph.** ..... Archiv für Ophthalmologie. Berlin, Leipzig.  
1854— B.M.; Camb.U.; Edinb.U.; Glasg.U.; Oxon.R.; R.C.Surg.; R.S.i.
- Arch. Gén. Méd.** ..... Archives Générales de Médecine. Paris.  
1823— B.M.; Camb.U.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; Oxon.R.; R.C.Surg.
- Arch. Hyg.** ..... Archiv für Hygiene. München, Leipzig.  
1883— Camb.U.; Chem.S.i.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; Oxon.R.; P.O.i.; R.C.Surg.
- Arch. Méd. Exp.** ..... Archives de Médecine Expérimentale et d'Anatomie Pathologique. Paris.  
1889— Camb.U.i.; Edinb.U.; Glasg.U.; Oxon.R.; R.C.Surg.; R.S.
- Arch. Méd. Nav.** ..... Archives de Médecine Navale. Paris.  
1864— B.M.; Edinb.U.i.; Glasg.P.S.i.; R.C.Surg.
- Arch. Méd. Phm. Mil.** ... Archives de Médecine et de Pharmacie Militaires. Paris.  
1883— [Continuation of: Recueil de Mémoires de Médecine, de Chirurgie, et de Pharmacie Militaires, 1815—82.] B.M.; R.C.Surg.i.
- Arch. Mikr. An.** ..... Archiv für mikroskopische Anatomie. Bonn.  
1865— B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Edinb.U.; Glasg.U.; Linn.S.; N.H.M.i.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Arch. Nth. Nvd.** ..... Archiv for Mathematik og Naturvidenskab. Kristiania.  
1876— B.M.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.U.i.; Math.S.i.; N.H.M.; Oxon.B.; Oxon.R.i.; R.S.
- Arch. Nth. Ph.** ..... Archiv der Mathematik und Physik; Grunert. Greifswald, Leipzig.  
1841— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Edinb.U.; Glasg.U.; Math.S.i.; Oxon.B.(R.); R.S.; U.C.L.i.  
*See Grunert Arch.*
- Arch. Néerl.** ..... Archives Néerlandaises des Sciences Exactes et Naturelles. La Haye, Harlem.  
1866— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.M.i.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.; Linn.S.; Math.S.; N.H.M.; Oxon.R.; P.O.; R.S.; S.K.; U.C.L.i.
- Arch. Ohrh.** ..... Archiv für Ohrenheilkunde. Würzburg.  
1864— R.C.Surg.
- Arch. Oph.** ..... Archives of Ophthalmology. New York.  
1879— [Continuation of: Archives of Ophthalmology and Otology, 1869—78.] B.M.i.; Glasg.U.i.; Oxon.R.; R.C.Surg.
- Arch. Oph. Ot.** ..... Archives of Ophthalmology and Otology. New York.  
1869—78. [Continued as: Archives of Ophthalmology, 1879—, and Archives of Otology, 1879—] B.M.; Glasg.P.S.i.; Glasg.U.i.; Oxon.R.; R.C.Surg.
- Arch. Ot.** ..... Archives of Otology. New York.  
1879— [Continuation of: Archives of Ophthalmology and Otology, 1869—78.] B.M.i.; Glasg.U.i.; Oxon.R.; R.C.Surg.
- Arch. Phm.** ..... Archiv des Apothekervereins im nördlichen Teutschland. Archiv der Pharmacie. Schmalkalden, Lemgo, Hannover, etc.  
1822— Chem.S.i.; Pharm.S.i.; P.O.; R.C.Surg.i.
- Arch. Sc.** ..... Archives of Science and Transactions of the Orleans County Society of Natural Sciences. Newport, U.S.

## List of Serial Publications

- 1870—74. B.M.; Geol.S.i.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; R.S.
- Arch. Sc. Pa. It.**..... Bibliothèque Universelle. Archives des Sciences Physiques et Naturelles. Genève.
- 1846— [Continuation of: Bibliothèque Universelle des Sciences, etc., 1816—45.] B.M.; Camb.U.; Chem.S.i.; Dub.N.L.I.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.; Edinb.U.; Glasg.U.; I.CE.i.; M.O.i.; N.H.M.; Oxon.B.; P.O.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.
- Arch. Z. Exp.**..... See **Bb. Un. Arch.**  
Archives de Zoologie Expérimentale et Générale. Paris.
- 1872— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Arceuil Mm.**..... {Mémoires de Physique et de Chimie de la Société d'Arceuil. Paris.
- Arceuil Mm. Pa.**..... {1807—17. B.M.; Camb.U.; Chem.S.i.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.; Oxon.B.; P.O.; R.C.Surg.; R.S.; S.K.
- Arg. S. Cl. A.**..... Anales de la Sociedad Científica Argentina. Buenos Aires.
- 1876— B.M.i.; I.CE.i.; N.H.M.
- Arnhem Wtk.**..... Naturkundig Tijdschrift, inhoudende Phijsica, Chemie, Pharmacie, Natuurlijke Historie en Literatuur. Arnhem.
- 1843—60. N.H.M.
- Arras Mm. S. R.**..... Mémoires de la Société Royale d'Arras, pour l'Encouragement des Sciences, etc. Arras.
- 1817— Camb.U.; Glasg.P.S.i.; Oxon.B.i.
- As.**..... L'Astronomie. Revue d'Astronomie populaire, de Météorologie et de Physique du Globe. Paris.
- 1882—94. B.M.; Camb.U.i.; Edinb.R.S.; R.A.S.; R.S.i.; S.K.
- As. & Aspa.**..... Astronomy and Astrophysics. Northfield, Minn.
- 1892—94. [Continuation of: The Sidereal Messenger, 1888—91.]  
[Continued as: The Astrophysical Journal, 1895—] B.M.; Camb.P.S.i.; Dub.N.L.I.i.; R.A.S.; R.S.; S.K.
- A. Sc. Lomb. Ven.**..... Annali delle Scienze del Regno Lombardo-Veneto. Padova, Venezia.
- 1831—45. B.M.; Camb.U.; Dub.T.C.i.; Oxon.B.
- A. Sc. Nt.**..... Annales des Sciences Naturelles, comprenant la Physiologie animale et végétale, l'Anatomie comparée des deux règnes, la Zoologie, la Botanique, la Minéralogie et la Géologie. Paris.
- 1824— B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.T.C.; Geol.M.i.; Geol.S.i.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.i.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- As. Fr. C. E.**..... Association Française pour l'Avancement des Sciences. Compte Rendu. Paris, etc.
- 1872— B.M.; Camb.U.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.; M.O.i.; N.H.M.; P.O.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.
- Ashmole. S. P.**..... Abstracts of the Proceedings of the Ashmolean Society. Oxford.
- 1844—81. Camb.U.; Dub.R.D.S.; Edinb.R.S.i.; Geol.S.i.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.i.; R.S.; S.K.i.
- Ashmole. S. T.**..... Transactions of the Ashmolean Society. Oxford.
- 1834—76. Camb.U.; Dub.R.D.S.; Edinb.R.S.; N.H.M.i.; Oxon.B.i.; Oxon.R.; P.O.i.; R.S.i.; S.K.i.
- As. J.**..... The Astronomical Journal. Boston.
- 1851—61; 1888— B.M.; Camb.U.; Glasg.U.i.; Oxon.B.; Oxon.R.i.; R.A.S.; R.S.i.; S.K.
- As. Nr.**..... See **Gould As. J.**  
Astronomische Nachrichten; Schumacher. Altona.
- 1823— B.M.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.; Edinb.U.i.; Glasg.U.i.; I.CE.i.; Oxon.B.(R.); R.A.S.; R.S.; S.K.i.; U.C.L.i.
- As. J.**..... The Astrophysical Journal. Chicago.
- 1895— [Continuation of: Astronomy and Astrophysics, 1892—94.]  
B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.D.S.; Glasg.U.; Oxon.R.i.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.
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- At. S. Elvet.** ..... Atti della Società Elvetica delle Scienze Naturali. Lugano. 1833, 1860. N.H.M.; S.K.  
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- Batav. Gn. Vh.** ..... Verhandelingen van het Bataviaasch Genootschap der Kunsten en Wetenschappen. Batavia. 1778— B.M.; Camb.U.; Edinb.R.S.i.; Edinb.U.i.; Glasg.P.S.i.; Linn.S.i.; N.H.M.i.; Oxon.B.; R.Geogr. S.i.; R.S.
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- Bb. Mth.** ..... Bibliotheca Mathematica. Stockholm, Leipzig. 1887— B.M.; Camb.U.; Glasg.U.; Oxon.B.; Oxon.R.; R.S.; S.K.i.; U.C.L.
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- Belfast N.H. S. P.** ..... } *See Arch. Sc. Pa. Nt.*  
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- Berl. Ab.** ..... Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin. Berlin.  
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- Berl. Gendhamt. Arb.** ... Arbeiten aus dem Kaiserlichen Gesundheitsamte. Berlin.  
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1865— R.C.Surg.i.
- Berl. Z. Tel.**..... *See Berl. Tel. Vr. Z. and Tel. Vr. Z.*
- Bern Mt.**..... Mittheilungen der Naturforschenden Gesellschaft in Bern. Bern.  
1843— B.M.; Camb.P.S.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; N.H.M.; R.S.; S.K.
- Béziers S. Sc. Bul.**..... Bulletin de la Société d'Étude des Sciences Naturelles de Béziers. Béziers.  
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- Birm. Ph. S. P.**..... Proceedings of the Birmingham Philosophical Society. Birmingham.  
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- Bil. Sc. Fr. Belg.**..... Bulletin Scientifique de la France et de la Belgique. London, Paris, Berlin.  
1888— [Continuation of: Bulletin Scientifique...du Nord et des pays voisins, 1869—87.] Camb.U.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.R.
- Bil. Sc. Mth.**..... Bulletin des Sciences Mathématiques. Paris.  
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- Bil. Sc. Nord.**..... Bulletin Scientifique, Historique et Littéraire du Département du Nord et des pays voisins. Lille.

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- Bil. V. It.** .....  
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**Böhm. Gs. Wa. Jbr.** .....
- 1785—1892. B.M.i.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.i.; R.S.i.; S.K.i.  
*See Frag Ab.*  
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- Bologna Mm. S. Md.** ...  
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**Bologna N. Cm.** .....
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*See N. A. Sc. Nt.*  
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 1834—49. Camb.U.; Edinb.R.S.; N.H.M.; Oxon.B.; R.S.
- Bologna Opusc. Sc.** .....  
**Bologna Opusc. Sc. N. Col.** .....  
**Bologna Rd.**.....
- Opuscoli Scientifici. Bologna.  
 1817—23. B.M.; Camb.U.; Edinb.R.S.i.; N.H.M.; R.C.Surg.i.; S.K.  
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 1824—25. Camb.U.  
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 1851— B.M.; Camb.U.i.; Dub.T.C.; Edinb.R.S.i.; Glasg.U.i.; N.H.M.i.; Oxon.B.i.; R.A.S.i.; R.S.i.; U.C.L.i.
- Bône Ac. Hip. Bil.** .....  
**Bonn Cor.-Bl. NH. Vr.** ...  
**Bonn NH. Vr. Cor.-Bl.** ..  
**Bonn NH. Vr. Vh.** .....
- Bulletin de l'Académie d'Hippone. Bône.  
 1865— Camb.U.; N.H.M.i.  
 Correspondenzblatt des Naturhistorischen Vereins für Rheinland und Westphalen. Bonn.  
 1844— Dub.R.D.S.; Dub.R.I.A.i.; Glasg.P.S.i.; Linn.S.; N.H.M.  
 Verhandlungen des Naturhistorischen Vereins der Preussischen Rheinlande, Westfalens und des Reg.-Bezirks Osnabrück. Bonn.  
 1844— B.M.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.R.; R.C.Surg.i.; R.S.i.; S.K.  
*See Bonn Vh. NH. Vr. and Rheinl. Westphal. Vh.*
- Bonn Niedr. Ga. Sb.** .....  
**Bonn Sb. Niedr. Ga.** .....
- Sitzungsberichte der Niederrheinischen Gesellschaft für Natur- und Heilkunde zu Bonn. Bonn.  
 1854— B.M.i.; Camb.U.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.R.; R.S.i.; S.K.  
*See Rheinl. Westphal. Sb.*
- Bonn Vh. NH. Vr.**.....  
**Bordeaux Ac. Act.**.....
- See Bonn NH. Vr. Vh. and Rheinl. Westphal. Vh.*  
 Recueil des Actes de l'Académie des Sciences, Belles-Lettres, et Arts de Bordeaux. Bordeaux.  
 1839— B.M.i.; Dub.R.I.A.i.; Dub.T.C.i.; N.H.M.i.; Oxon.B.i.; R.S.i.  
*See Bordeaux Act.*

## List of Serial Publications

- Bordeaux Ac. Sc. S4. Pbl.** { Séances publiques de l'Académie Royale des Sciences, Belles-Lettres,  
**Bordeaux Ac. S4. Pbl. ...** { et Arts de Bordeaux. Bordeaux.  
 1819—37. N.H.M.
- Bordeaux Act. ....** { See **Bordeaux Ac. Act.**
- Bordeaux Act. Ac. Sc. ...** {
- Bordeaux J. Md. ....** { Journal de Médecine de Bordeaux. Bordeaux.  
 1843?—61. R.C.Surg.i.
- Bordeaux Mm. S. Sc. ...** { Mémoires de la Société des Sciences Physiques et Naturelles de  
**Bordeaux Mm. S. Sc. Pa.** { Bordeaux. Bordeaux.  
 1855— Camb.P.S.; Dub.R.D.S.; Dub.T.C.; Edinb.R.S.; Geol.S.;  
 Glasg.P.S.; Linn.S.; Math.S.; N.H.M.; Oxon.B.; R.A.S.; R.S.;  
 S.K.  
 See **Bordeaux S. Sc. Mm.**
- Bordeaux Obs. A. ....** { Annales de l'Observatoire de Bordeaux. Paris, Bordeaux.  
 1885— Dub.R.D.S.; R.A.S.; R.S.
- Bordeaux S. L. Act. ....** { Actes de la Société Linnéenne de Bordeaux. Bordeaux.  
 1830— [Continuation of: Bulletin d'Histoire Naturelle de la  
 Société, etc., 1826—29.] B.M.; Camb.U.; Dub.R.D.S.i.; Dub.  
 R.I.A.i.; Geol.S.i.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; R.S.i.;  
 U.C.L.i.
- Bordeaux S. Md. Mm. ...** { Mémoires et Bulletins de la Société Médico-Chirurgicale des Hôpitaux  
 et Hospices de Bordeaux. Paris, Bordeaux.  
 1866—71.  
 Mémoires et Bulletins de la Société de Médecine et de Chirurgie de  
 Bordeaux. Paris, Bordeaux.  
 1872— Dub.R.D.S.; R.S.  
 See **Bordeaux Mm. S. Sc.**
- Bordeaux S. Sc. Mm. ...** {
- Bordeaux S. Sc. FV. ....** { Procès-Verbaux des Séances de la Société des Sciences Physiques  
 et Naturelles de Bordeaux. Paris, Bordeaux.  
 1894— Camb.P.S.; Dub.R.D.S.i.; Edinb.R.S.; Math.S.; N.H.M.;  
 R.A.S.; R.S.
- Bost. Am. Ac. Mm. ....** { Memoirs of the American Academy of Arts and Sciences. Cambridge,  
**Bost. Mm. Am. Ac. ....** { Boston.  
 1785— B.M.i.; Camb.P.S.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.;  
 Dub.T.C.i.; Edinb.R.S.; Geol.S.i.; I.CE.i.; Linn.S.; N.H.M.;  
 Oxon.R.; P.O.i.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.  
 See **Am. Ac. Mm.**
- Bost. S. Md. Sc. J. ....** { Journal of the Boston Society of Medical Sciences. Boston.  
 1897— Glasg.P.S.i.; R.C.Surg.
- Bost. S. NH. P. ....** { Proceedings of the Boston Society of Natural History. Boston.  
 1841— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.I.A.; Edinb.R.S.;  
 Edinb.U.i.; Geol.S.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; Oxon.R.;  
 R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Brain** ..... { Brain: a Journal of Neurology. London, New York.  
 1878— B.M.; Camb.U.; Glasg.P.S.i.; Oxon.B.; Oxon.B.;  
 R.C.Surg.; U.C.L.
- Br. Archt. I. Fp. ....** { Papers read at the Royal Institute of British Architects. London.  
 1854—78. B.M.; Camb.U.i.; Edinb.R.S.i.; P.O.; S.K.; U.C.L.i.  
 See **Br. Archt. Fp.**
- Br. Archt. I. T. ....** { Transactions of the Institute of British Architects of London.  
 London.  
 1836—42; 1879—92. B.M.i.; Camb.U.; Dub.T.C.; Edinb.R.S.i.;  
 Edinb.U.i.; I.CE.i.; Oxon.B.; P.O.; R.S.; U.C.L.i.  
 See **Br. Archt. T.**
- Br. Archt. J. ....** { Journal of the Royal Institute of British Architects. London.  
 1885— Camb.U.i.; Edinb.U.i.; Glasg.U.i.; I.CE.; Oxon.B.; P.O.;  
 U.C.L.
- Br. Archt. Fp. ....** { See **Br. Archt. I. Fp.**
- Br. Archt. Fp. (& T.) ....** { See **Br. Archt. I. T.**
- Br. Archt. T. ....** { See **Br. Archt. I. T.**
- Braunsch. Vr. Nt. Jbr.** { Jahresbericht des Vereins für Naturwissenschaft zu Braunschweig.  
 Braunschweig, Altenburg.  
 1879— Dub.R.I.A.i.; Edinb.R.S.; Linn.S.; N.H.M.; R.S.
- Brem. Ab. ....** { Abhandlungen herausgegeben vom Naturwissenschaftlichen Vereine  
 zu Bremen. Bremen.  
 1868— B.M.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.;  
 Linn.S.; N.H.M.; R.S.; S.K.

## List of Serial Publications

- Brescia At. Cm.** ..... Commentarj della Aocademia di Scienze, Lettere, Agricoltura ed  
**Brescia Cm.** ..... Arti del Dipartimento del Mella. Brescia.  
**Brescia Cm. Aten.** ..... 1808—11.  
 Commentarj dell' Ateneo di Brescia. Brescia.  
 1812— B.M.; Camb.U.; N.H.M.i.; Oxon.B.i.; R.S.i.  
**Bresl. Jbr. Schl. Ga.** ..... Jahresbericht der Schlesischen Gesellschaft für vaterländische  
**Bresl. Schl. Ga. Jbr.** ..... Cultur. Breslau.  
 1850— [*Continued as*: Uebersicht der Arbeiten, etc., 1824—49.]  
 Dub.R.D.S.i.; Dub.R.I.A.i.; Geol.S.i.; N.H.M.; R.C.Surg.i.;  
 R.S.; S.K.  
**Bresl. Schl. Ga. Übs.** ..... Uebersicht der Arbeiten und Veränderungen der Schlesischen  
 Gesellschaft für vaterländische Cultur. Breslau.  
 1824—49. [*Continued as*: Jahresbericht, etc., 1850—] B.M.; Geol.  
 S.i.; N.H.M.; R.S.; S.K.  
**Brest S. Ac. Bil.** ..... Bulletin de la Société Académique de Brest. Brest.  
 1858— B.M.; Camb.U.i.; S.K.i.  
**Brighton NH. S. Sp.** ..... Brighton and Sussex Natural History and Philosophical Society.  
 Annual Report. Brighton.  
 1855— Geol.S.i.; Glasg.P.S.i.; N.H.M.; R.S.i.  
**Bristol Mt. S. P.** ..... Proceedings of the Bristol Naturalists' Society. Bristol.  
 1866— B.M.i.; Camb.U.i.; Geol.M.; Geol.S.i.; Linn.S.; N.H.M.;  
 R.C.Surg.i.; R.S.i.; U.C.L.i.  
**Br. Met. S. P.** ..... Proceedings of the [British] Meteorological Society. London.  
 1861—71. [*Continued as*: Quarterly Journal of the [Royal] Meteo-  
 rological Society, 1872—] Camb.U.; Dub.R.D.S.; Edinb.R.S.;  
 Glasg.P.S.i.; M.O.; Oxon.B.; R.A.S.; R.S.; S.K.  
**Brosche Z.** ..... Zeitschrift für Natur- und Heilkunde; Brosche, Carus, Choulant, etc.  
 Dresden.  
 1820—30. Edinb.U.i.; Glasg.P.S.i.; R.C.Surg.; R.S.; U.C.L.i.  
**Brown-Séguard J. Fl.** ... Journal de la Physiologie de l'Homme et des Animaux; Brown-  
 Séguard. Paris.  
 1858—65. [*Continued as*: Archives de Physiologie, etc., 1868—98.]  
 B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; Oxon.B.;  
 Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.i.  
**Br. Pharm. Conf. P.** ..... Proceedings of the British Pharmaceutical Conference. London.  
 1864—69. [*Continued as*: Transactions, etc., 1870—] B.M.;  
 Camb.U.i.; Chem.S.; Glasg.P.S.i.; Oxon.B.; Pharm.S.; R.S.  
**Brugnatelli G.** ..... Giornale di Fisica, Chimica, e Storia Naturale; Brugnatelli, etc.  
 Pavia.  
 1808—27. B.M.; Camb.U.; Dub.T.C.; N.H.M.i.; Oxon.B.; P.O.;  
 R.C.Surg.; R.S.  
**Brünn Jh. Nw. Sect.** ..... Jahresheft der Naturwissenschaftlichen Section der K. K. Mährisch-  
 Schlesischen Gesellschaft für Ackerbau, Natur- und Landes-  
 Kunde. Brünn.  
 1858. S.K.  
**Brünn Mt.** ..... Mittheilungen der kaiserlich-königlichen Mährisch-Schlesischen  
 Gesellschaft zur Beförderung des Ackerbaues, der Natur- und  
 Landeskunde in Brünn. Brünn.  
 1821—91. B.M.; R.S.i.; S.K.i.  
**Brünn Notb.** ..... Notizen-Blatt der Historisch-statistischen Section der K. K. Mährisch-  
 Schlesischen Gesellschaft zur Beförderung des Ackerbaues, der  
 Natur- und Landes-Kunde in Brünn. Brünn.  
 1855— B.M.; Glasg.P.S.i.; S.K.  
**Brünnow As. Not.** ..... Astronomical Notices; Brünnow. Ann Arbor, Mich.  
 1858—62. R.A.S.; R.S.i.  
**Brünn Vh.** ..... Verhandlungen des Naturforschenden Vereins zu Brünn. Brünn.  
 1863— Camb.U.i.; Dub.R.I.A.; Linn.S.; N.H.M.; R.S.  
**Brux. Ac. Bil.** ..... Bulletins de l'Académie Royale des Sciences, etc., de Belgique.  
 Bruxelles.  
 1834— B.M.i.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;  
 Edinb.R.S.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.;  
 Math.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.C.Surg.;  
 R.Geogr.S.i.; R.S.; S.K.i.  
*See Brux. Bil. Ac.*  
**Brux. Ac. Cent. Anniv.** ..... Centième Anniversaire de Fondation (1772—1872) de l'Académie  
 Royale de Belgique. Bruxelles.  
 1872. B.M.; Camb.U.; Chem.S.; Dub.R.I.A.; Edinb.R.S.; Géol.S.;

## List of Serial Publications

- Glasg.P.S.; Glasg.U.; I.CE.; Linn.S.; N.H.M.; P.O.; R.A.S.; R.Geogr.S.; R.S.; S.K.
- Brux. Ac. Méd. Bil.**..... Bulletin de l'Académie Royale de Médecine de Belgique à Bruxelles. Bruxelles.  
1841— B.M.; Camb.U.; Dub.R.D.S.; Dub.T.C.i.; Glasg.P.S.i.; Oxon.B.(R.); R.C.Surg.i.; R.S.
- Brux. Ac. Méd. (Mém. Sav. Étr.)**... Mémoires de l'Académie Royale de Médecine de Belgique: Mémoires des Concours et des Savants Étrangers. Bruxelles.  
1847— B.M.; Camb.U.; Glasg.P.S.i.; Oxon.B.(R.); R.C.Surg.; R.S.
- Brux. As. Mém.** ..... Mémoires de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique. Bruxelles.  
**Brux. Ac. Sc. Mém.** ..... 1820— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.i.; Edinb.U.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.(R.); P.O.i.; R.A.S.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.i.
- See Brux. Mém. Ac. Sc.*  
**Brux. A. Tr. Pbl.** ..... Annales des Travaux Publics de Belgique. Bruxelles.  
1843— B.M.; I.CE.i.; P.O.; S.K.i.
- Brux. A. Un.** ..... Annales des Universités de Belgique. Bruxelles.  
1842—63. Camb.U.; Oxon.B.; P.O.; R.S.i.
- Brux. Bil. Ac.** ..... *See Brux. Ac. Bil.*
- Brux. Bil. Pht.** ..... Bulletin Belge de la Photographie. Bruxelles.  
1862—81. B.M.; Glasg.P.S.i.; P.O.
- Brux. J. S. Ag.** ..... Journal de la Société Centrale d'Agriculture de Belgique. Bruxelles.  
1854— B.M.; Glasg.P.S.i.; P.O.
- See Brux. Ac. Mém.*  
**Brux. Mém. Ac. Sc.** ..... Mémoires Couronnés et Mémoires des Savants Étrangers, publ. par l'Acad. Roy. des Sciences, etc. de Belgique. 4to. Bruxelles.  
**Brux. Mém. Cour. 4°**..... 1818— B.M.i.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Edinb.U.; Geol.S.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.(R.); P.O.i.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.
- Brux. Mém. Cour. 8°**..... Mémoires Couronnés et autres Mémoires, publ. par l'Acad. Roy. des Sciences, etc. de Belgique. 8vo. Bruxelles.  
1840— B.M.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.; Geol.S.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; P.O.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.
- Brux. S. Belg. As. Bil.** ... Bulletin de la Société Belge d'Astronomie. Comptes Rendus des Séances mensuelles de la Société et Revue des Sciences d'Observation, Astronomie, Météorologie, Géodésie et Physique du Globe. Bruxelles.  
1896— R.A.S.
- Brux. S. Belg. Géol. Bil.**..... Bulletin de la Société Belge de Géologie, de Paléontologie et d'Hydrologie. Bruxelles.  
1887— B.M.; Geol.M.; Geol.S.; Glasg.P.S.i.; N.H.M.; R.S.; S.K.; U.C.L.
- Brux. S. Belg. Micr. A.** ... Annales de la Société Belge de Microscopie. Bruxelles.  
1875— Camb.P.S.i.; Glasg.P.S.i.; N.H.M.; P.O.i.
- Brux. S. Belg. Micr. Bil.** ... Bulletin de la Société Belge de Microscopie. Bruxelles, Paris.  
1875— Camb.P.S.i.; Glasg.P.S.i.; N.H.M.; P.O.i.
- Brux. S. Sc. A.** ..... Annales de la Société Scientifique de Bruxelles. Bruxelles.  
1877— B.M.; Dub.N.L.I.i.; Edinb.R.S.; I.CE.i.; N.H.M.
- Bt. Gb.** ..... Botanisches Centralblatt. Cassel.  
1880— B.M.; Camb.U.; Edinb.R.S.i.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; R.S.; S.K.; U.C.L.
- Bt. Gz.** ..... The Botanical Gazette. Crawfordville.  
1875— Glasg.P.S.i.; Glasg.U.i.; Linn.S.i.; N.H.M.; Pharm.S.i.; S.K.i.; U.C.L.i.
- Bt. Not.**..... Botaniska Notiser. Lund.  
1839— B.M.; Camb.U.; Glasg.P.S.i.; Linn.S.; N.H.M.
- Btr. An. Fl.** ..... Beiträge zur Anatomie und Physiologie; Eckhard. Giessen.  
1858—88. Camb.U.; Edinb.U.; N.H.M.; Oxon.R.; R.S.; U.C.L.i.
- Btr. Geops.** ..... Beiträge zur Geophysik. Stuttgart, Leipzig.  
1887— Camb.U.; Edinb.U.; Geol.M.; Geol.S.; M.O.; Oxon.B.; R.Geogr.S.; R.S.; S.K.
- Bt. Etg.**..... Botanische Zeitung. Berlin, Leipzig.  
1843— B.M.; Camb.U.; Edinb.R.S.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; R.S.; S.K.; U.C.L.i.

## List of Serial Publications

- Bucarest Ac. Rom. A. ...** Analele Academiei Romane. Bucuresci.  
1880— B.M.; Camb.U.i.; M.O.i.; N.H.M.i.
- Bucarest S. Sc. Bl. ....** Buletinul Societății de Științe Fizice (Fizica, Chimia și Mineralogia)  
din Bucuresci-România.  
[1892]—[1896].  
Buletinul Societății de Științe din Bucuresci-România. Bucuresci.  
(Bulletin de la Société des Sciences Bucarest-Roumanie.)  
[1897]— Glasg.P.S.; Glasg.U.; N.H.M.; R.S.i.; U.C.L.i.
- Buda Tudománytár .....** Tudománytár Közre bocsátja a Magyar Tudós Társaság. [Repertory  
of Science.] Budán.  
1833—48. B.M.; Glasg.P.S.i.; R.S.i.
- Cádiz Period. M. Cl. ....** Periódico mensual de Ciencias matemáticas y físicas. Cádiz.  
1848. B.M.; R.S.
- Caen Ac. Mm. ....** Mémoires de l'Académie des Sciences, Arts et Belles-Lettres de  
Caen. Caen.
- Caen Mm. Ac. ....** 1811— B.M.i.; Camb.U.i.; Dub.T.C.i.; N.H.M.i.; Oxon.B.i.; R.S.i.;  
S.K.i.
- Caen Mm. S. L. ....** Mémoires de la Société Linnéenne du Calvados [de Normandie]. Caen.  
1824— B.M.; Camb.U.; Edinb.U.i.; Geol.M.; Geol.S.i.; Linn.S.i.;  
N.H.M.; R.S.i.; U.C.L.i.
- Caen S. L. Ill. ....** Bulletin de la Société Linnéenne de Normandie. Caen.  
1855— B.M.; Camb.U.; Geol.S.i.; Glasg.P.S.i.; Linn.S.; N.H.M.;  
R.S.i.; U.C.L.i.  
*See Norm. S. L. Ill.*
- Caen Tr. ....** Précis des Travaux de la Société d'Agriculture, etc. de Caen. Caen.  
1811—58. B.M.; Camb.U.i.
- Ces. Leop. Ac. N. Acta.** Nova Acta physico-medica Academiae Cæs. Leopoldino-Carolinæ  
Naturæ Curiosorum. Erlangen, Bonn, Breslau.  
1758— Camb.P.S.; Camb.U.; Chem.S.i.; Dub.T.C.; Edinb.R.S.i.;  
Edinb.U.; Geol.S.i.; Glasg.U.; Linn.S.i.; N.H.M.; Oxon.R.;  
Pharm.S.i.; R.A.S.i.; R.C.Surg.; R.S.; S.K.i.; U.C.L.i.  
*See Ac. Cæs. Leop. N. Acta and Ac. Nt. C. N. Acta.*
- Calc. J. NH. ....** The Calcutta Journal of Natural History. Calcutta.  
1841—48. B.M.; Camb.U.; Dub.R.D.S.; Geol.S.i.; Linn.S.i.;  
N.H.M.; Oxon.R.; P.O.; R.S.; S.K.
- Calc. QJ. ....** Quarterly Journal of the Medico-Physical Society. Calcutta.  
1857. Edinb.U.i.; Glasg.P.S.i.
- Calif. Ac. F. ....** Proceedings of the California Academy of Natural Sciences. San  
Francisco.  
1854— B.M.i.; Camb.P.S.i.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.i.;  
Glasg.P.S.; Linn.S.i.; N.H.M.; P.O.i.; R.Geogr.S.; R.S.i.;  
S.K.i.
- Camb. and Dubl. Meth. J.** The Cambridge and Dublin Mathematical Journal; Thomson and  
Ferrers. Cambridge.  
1846—54. B.M.; Camb.P.S.i.; Camb.U.; Dub.T.C.i.; Edinb.R.S.;  
Edinb.U.; Glasg.U.; N.H.M.; Oxon.B.; R.S.; U.C.L.
- Camb. (M.) Meth. M. ....** The Mathematical Monthly; Runkle. Cambridge (Massachusetts).  
1859—61. B.M.; Camb.U.; Oxon.B.; P.O.; R.A.S.i.; R.S.; U.C.L.  
*See Camb. (U.S.) Meth. M.*
- Camb. Meth. J. ....** The Cambridge Mathematical Journal. London.  
1839—45. B.M.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.U.;  
Glasg.U.; Math.S.i.; Oxon.B.i.; R.S.; U.C.L.
- Camb. Ph. S. P. ....** Proceedings of the Cambridge Philosophical Society. Cambridge.  
1866— B.M.i.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.;  
Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.;  
I.C.E.; Linn.S.i.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.i.; Oxon.  
R.i.; P.O.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.; U.C.L.
- Camb. Ph. S. T. ....** Transactions of the Cambridge Philosophical Society. Cambridge.  
1822— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.T.C.i.;  
Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.C.E.i.;  
Linn.S.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.;  
R.A.S.; R.C.Surg.; R.S.; S.K.; U.C.L.  
*See Camb. (M.) Meth. M.*
- Camb. (U.S.) Meth. M. ...**  
**Canth Cronaca ....** Cronaca: Giornale di Scienze, Lettere, Arti, Economia, Industria;  
Canth. Milano.  
1855—58. Glasg.P.S.i.; R.S.

## List of Serial Publications

- Card. Mt. S. T.**..... Cardiff Naturalists' Society. Reports and Transactions. Cardiff.  
1868— B.M.i.; Camb.U.i.; Dub.R.D.S.; Geol.M.i.; Geol.S.i.;  
Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.B.i.; R.S.i.
- Carl Epon.**..... Repertorium für physikalische Technik, für mathematische und  
astronomische Instrumentenkunde; Carl. München.  
1865—82. [*Continued as*: Repertorium der Physik; Exner, 1883—91.]  
B.M.; Camb.U.i.; Dub.N.L.I.i.; I.CE.i.; M.O.; Oxon.R.; P.O.;  
R.S.; S.K.
- Carlsruhe Vh. Nw. Vr.**... Verhandlungen des Naturwissenschaftlichen Vereins. Carlsruhe.  
1864— B.M.i.; Dub.R.I.A.; Geol.S.i.; N.H.M.  
*See Karlsruhe Mt. Vr. Vh.*
- Casopis** ..... Casopis pro Pěstování Matematiky a Fysiky. Prag.  
1872— B.M.
- Catania Ac. Gioen. At.**... Atti dell' Accademia Gioenia di Scienze Naturali in Catania. Catania.  
1825— B.M.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.i.;  
Linn.S.i.; Math.S.i.; N.H.M.; Oxon.B.; R.S.; S.K.i.  
*See Catania At. Ac. Gioen.*
- Catania Ac. Gioen. Bil.**... Bullettino mensile della Accademia Gioenia di Scienze Naturali in  
Catania. Catania.  
1888— Dub.R.I.A.; Edinb.R.S.; Math.S.i.; N.H.M.; R.S.
- Catania At. Ac. Gioen.**... *See Catania Ac. Gioen. At.*
- Cattaneo Eb. Farm.** ..... Biblioteca di Farmacia, Chimica, etc.; Cattaneo. Milan.  
1834—45. [*Continuation of*: Giornale, etc., 1824—33.] B.M.
- Cattaneo G. Farm.**..... Giornale di Farmacia, etc.; Cattaneo. Milan.  
1824—33. [*Continued as*: Biblioteca, etc., 1834—45.] B.M.
- Cb. Md. Wa.**..... Centralblatt für die Medicinischen Wissenschaften. Berlin.  
1863— B.M.; Camb.U.i.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.;  
Oxon.R.; R.C.Surg.; R.S.i.; U.C.L.i.
- Cb. Min.** ..... Centralblatt für Mineralogie, Geologie und Palaeontologie. Stuttgart.  
1900— B.M.; Camb.U.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.;  
Glasg.P.S.i.; Glasg.U.; N.H.M.; Oxon.R.; R.S.; S.K.
- Cb. Fl.**..... Centralblatt für Physiologie. Leipzig, Wien.  
1887— B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.;  
Oxon.R.; R.C.Surg.; U.C.L.i.
- C. CE.** ..... Chemisches Central-Blatt. Leipzig.  
1856— Camb.U.i.; Chem.S.i.; N.H.M.; Oxon.R.; Pharm.S.i.;  
P.O.; R.S.; S.K.; U.C.L.i.
- CE. I. F.**..... Minutes of Proceedings of the Institution of Civil Engineers, con-  
taining Abstracts of the Papers and of the Discussions. London.  
1837— B.M.; Camb.P.S.; Camb.U.; Dub.R.C.S.; Dub.R.D.S.;  
Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.i.;  
Glasg.U.; I.CE.; Oxon.B.; Oxon.R.i.; P.O.; R.Geogr.S.; R.S.;  
S.K.; U.C.L.
- See I. CE. F.*
- CE. I. T.**..... Transactions of the Institution of Civil Engineers. London.  
1836—42. B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.;  
Dub.R.D.S.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.U.; I.CE.;  
Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.; R.S.; U.C.L.i.
- Cg. Int. Chron.** ..... Congrès International de Chronométrie. Comptes Rendus des  
Travaux, Procès-Verbaux, Rapports et Mémoires. Paris.  
1889, 1900. Camb.U.; R.S.i.; S.K.
- Cg. Int. Hyg. C. R.**..... Congrès International d'Hygiène et de Démographie. Comptes-  
Rendus [Arbeiten, Transactions, Actas]. Paris, etc.  
1878— Glasg.P.S.i.; I.CE.i.; Oxon.R.i.; P.O.i.; R.C.Surg.i.
- Cg. Int. Md. C. R.** ..... Comptes-Rendus [Atti, Verhandlungen, Transactions] du Congrès  
International de Médecine. Paris, etc.
- Cg. Md. Int. At.** ..... 1867— B.M.; Camb.U.i.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.  
*See Int. Md. Cg. T. and Int. Md. Cg. Vh.*
- C. Gz.** ..... Chemical Gazette. London.  
1842—59. B.M.; Camb.U.; Chem.S.; Dub.T.C.i.; Edinb.U.i.;  
I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.i.; S.K.;  
U.C.L.
- Chambéry Mm. Ac. Sav.** Mémoires de la Société Académique de Savoie. Chambéry.  
1825— Camb.U.; Dub.R.I.A.; Dub.T.C.; N.H.M.; Oxon.B.; R.S.i.  
*See Sav. Ac. Mm.*
- Charleston Md. J.** ..... Charleston Medical Journal and Review; Gaillard, de Saussure, etc.  
Charleston.

## List of Serial Publications

- 1848—60. [*Continuation of: The Southern Journal of Medicine, etc., 1846—47.*] B.M.
- Charleston South. J. Med.** The Southern Journal of Medicine, etc.; Smith and Sinkler. Charleston.
- 1846—47. [*Continued as: Charleston Medical Journal and Review, 1848—60.*] B.M.
- Chemist** ..... The Chemist. London.
- 1840—58. B.M.; Camb.U.i.; Chem.S.; Dub.T.C.i.; Edinb.U.i.; I.CE.i.; Oxon.B.; Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.i.
- Chemnitz B.** ..... Bericht der Naturwiss. Gesellsch. zu Chemnitz. Chemnitz.
- 1859— Edinb.R.S.i.; N.H.M.; R.S.i.
- Cherb. Mm. S. Ac.** ..... Mémoires de la Société Académique de Cherbourg. Cherbourg.
- 1833— B.M.; Camb.U.i.; Edinb.R.S.i.; N.H.M.i.; Oxon.B.i.
- Cherb. Mm. S. Sc.** ..... } Mémoires de la Société Impériale des Sciences Naturelles de Cherbourg. Cherbourg.
- Cherb. S. Sc. Mm.** ..... } 1852— B.M.; Camb.P.S.; Camb.U.; Dub.B.I.A.; Edinb.R.S.i.; I.CE.i.; Linn.S.; N.H.M.; R.A.S.i.; R.S.; S.K.
- Cherb. S. Sc. Nt. Mm.** ..... }
- Chili S. Sc. Act.** ..... Actes de la Société Scientifique du Chili (Sociedad científica de Chile). Santiago.
- 1892— B.M.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.; Linn.S.i.; N.H.M.; R.S.i.
- Christiania F.** ..... Forhandlinger i Videnskabs-Selskabet i Christiania. Christiania.
- 1859— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Geol.S.i.; Glasg.P.S.; N.H.M.; Oxon.B.; R.Geogr.S.i.; R.S.; U.C.L.i.
- Christiania Skr. (Mth.-Nt. Kl.)** ..... Skrifter udgivne af Videnskabselskabet i Christiania. Matematisk-Naturvidenskabelig Klasse. Christiania.
- 1894— B.M.; Camb.P.S.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.P.S.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.; U.C.L.i.
- Ciel et Terre** ..... Ciel et Terre. Revue populaire d'Astronomie, de Météorologie et de Physique du Globe. Bruxelles.
- 1881— B.M.; Edinb.R.S.i.; M.O.; R.A.S.
- Cincin. S. WH. J.** ..... The Journal of the Cincinnati Society of Natural History. Cincinnati.
- 1878— B.M.; Camb.P.S.; Edinb.R.S.; Geol.S.i.; N.H.M.; R.S.
- Civing.** ..... Der Civilingenieur: Zeitschrift für das Ingenieurwesen. Freiberg, Leipzig.
- 1854—96. B.M.; Camb.U.i.; Dub.R.I.A.i.; I.CE.; P.O.
- Clermont Mm. Ac. Sc.** ..... Mémoires de l'Académie des Sciences, Belles Lettres, et Arts de Clermont-Ferrand. Clermont-Ferrand.
- 1859— [*Continuation of: Annales Scientifiques, etc., 1828—58.*] B.M.; Camb.U.; Glasg.P.S.i.; R.S.i.
- C. N.** ..... The Chemical News and Journal of Physical Science. London.
- 1860— Camb.P.S.; Camb.U.i.; Chem.S.; Dub.N.L.I.i.; Dub.R.C.S.i.; Dub.R.D.S.i.; Edinb.U.; Geol.M.; Geol.S.i.; Glasg.P.S.; I.CE.i.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Ca. I. F.** ..... Proceedings of the Canadian Institute, Toronto. Toronto.
- 1879—90; 1897— [*Continuation of: The Canadian Journal, 1853—78.*] B.M.; Camb.P.S.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.i.; Edinb.U.; Geol.S.i.; Glasg.P.S.; I.CE.i.; Linn.S.; Math.S.i.; N.H.M.; Oxon.B.; P.O.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.
- Ca. I. T.** ..... Transactions of the Canadian Institute. Toronto.
- 1889— B.M.; Camb.P.S.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.; I.CE.i.; Linn.S.; Math.S.i.; N.H.M.; P.O.; R.A.S.; R.Geogr.S.; R.S.
- Ca. J.** ..... The Canadian Journal of Industry, Science, and Art. Toronto.
- 1853—78. [*Continued as: Proceedings of the Canadian Institute, 1879—*] B.M.i.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; I.CE.; N.H.M.; P.O.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.i.
- Ca. Nt.** ..... The Canadian Naturalist and Geologist, and Proceedings of the Natural History Society of Montreal. Montreal.
- 1857—83. [*Continued as: The Canadian Record of Science, 1884—*] B.M.; Camb.U.i.; Edinb.U.i.; Geol.S.i.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.; R.S.; U.C.L.i.
- Ca. Sc. Sc.** ..... The Canadian Record of Science, including the Proceedings of the



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- Natural History Society of Montreal, and replacing the Canadian Naturalist. Montreal.
- 1884— [*Continuation of: The Canadian Naturalist, 1857—83.*] B.M.; Camb.U.i.; Dub.R.D.S.; Edinb.R.S.; Geol.S.i.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; R.S.; S.K.i.
- Can. R. S. P. & T.** ..... Proceedings and Transactions of the Royal Society of Canada. Montreal.
- 1883— Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Geol.M.i.; Geol.S.; Glasg.P.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.
- Coimbra I** ..... O Instituto, jornal scientifico e litterario; Forjaz. Coimbra.
- 1853— B.M.; R.Geogr.S.i.
- Colmar S. H. Nt. Bul** ... Bulletin de la Société d'Histoire Naturelle de Colmar. Colmar.
- 1860—85. N.H.M.
- Colo. Sc. S. P.** ..... Proceedings of the Colorado Scientific Society. Denver.
- 1883— Camb.P.S.i.; Chem.S.i.; Edinb.R.S.; Geol.S.i.; Glasg.P.S.; N.H.M.; P.O.
- Con. des Temps** ..... Connaissance des Temps, à l'usage des Astronomes et des Navigateurs. Paris.
- 1879— B.M.i.; Camb.U.; Dub.T.C.; Glasg.U.i.; I.CE.i.; Oxon.B.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.
- Conegl. Scuola Vit. En.A.** Annali della R. Scuola di Viticoltura e di Enologia in Conegliano. Conegliano.
- 1892—93. [*Continuation of: Nuova Rassegna di Viticoltura ed Enologia della R. Scuola di Conegliano, 1887—91.*] [*Continued as: La Revista. Periodico della R. Scuola di Viticoltura e di Enologia di Conegliano, 1895—*] Kew Gardens.i.
- Conegl. Scuola Vit. En. Rv.** La Revista. Periodico della R. Scuola di Viticoltura e di Enologia di Conegliano. Conegliano.
- 1895— [*Continuation of: Annali della R. Scuola di Viticoltura e di Enologia in Conegliano, 1892—93.*] Kew Gardens.
- Conn. Ac. T.** ..... Transactions of the Connecticut Academy of Arts and Sciences. New Haven.
- 1866— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Glasg.P.S.; Linn.S.; Math.S.i.; N.H.M.; Oxon.R.; P.O.; R.A.S.; R.Geogr.S.; R.S.; S.K.
- Conn. Mem. Ac.** ..... Memoirs of the Connecticut Academy of Arts and Sciences. New Haven.
- 1810—16. Linn.S.i.; N.H.M.i.; R.S.
- Cornwall Gl. S. T.** ..... Transactions of the Royal Geological Society of Cornwall. Penzance.
- 1818— B.M.i.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Geol.M.; Geol.S.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.; R.S.; S.K.i.; U.C.L.i.
- Cornwall Pol. S. Rp.** ..... Reports and Transactions of the Royal Polytechnic Society of Cornwall. Falmouth.
- Cornwall Pol. S. T.** ..... { 1833— B.M.; Camb.U.i.; Dub.R.D.S.; Edinb.R.S.i.; Geol.M.i.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; M.O.i.; N.H.M.; Oxon.B.i.; P.O.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
- Cosmos** ..... Cosmos. Revue Encyclopédique Hebdomadaire des Progrès des Sciences; Moigno. Paris.
- 1852—70. B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; I.CE.i.; N.H.M.; Oxon.B.; P.O.; R.A.S.i.; R.S.; S.K.i.
- See Moigno Cosmos.*
- C. R.** ..... Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences. Paris.
- 1835— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.; Edinb.R.S.i.; Edinb.U.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.; Linn.S.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.i.; Pharm.S.i.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.
- Cre. Ac. Sc. Bul** ..... Bulletin International de l'Académie des Sciences de Cracovie. Cracovie.
- 1889— B.M.; Camb.U.; Chem.S.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.; Glasg.U.; N.H.M.; Oxon.B.; Oxon.R.i.; R.A.S.i.; R.S.; U.C.L.i.

## List of Serial Publications

- Crell C. A.**..... Chemische Annalen für die Freunde der Naturlehre; Crell. Helmstädt. 1784—1804. B.M.; Camb.U.; Chem.S.; Glasg.P.S.i.; N.H.M.; P.O.; R.C.Surg.; R.S.; S.K.
- Crelle J.**..... Journal für die reine und angewandte Mathematik; Crelle. Berlin. 1826— B.M.; Camb.U.; Dub.N.L.I.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Glasg.U.; I.CE.i.; Math.S.i.; Oxon.B.(R.); R.S.; S.K.i.; U.C.L.  
See **Crelle J. Mth.**
- Crelle J. Bauk.** ..... Journal für die Baukunst; Crelle. Berlin. 1829—51. B.M.; Camb.U.; Glasg.U.; P.O.
- Crelle J. Mth.** ..... See **Crelle J.**
- Croydon Micr. Cl. F. & T.** Proceedings and Transactions of the Croydon Microscopical and Natural History Club. Croydon. 1878— [Continuation of: Report, etc., 1871—78.] Camb.U.; Geol.S.i.; Glasg.P.S.i.; Linn.S.; N.H.M.; P.O.; U.C.L.i.
- C. S. J.** ..... The [Quarterly] Journal of the Chemical Society of London. London. 1849— [Continuation of: Memoirs and Proceedings, etc., 1841—48.] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.M.i.; Geol.S.; Glasg.P.S.; I.CE.; N.H.M.i.; Oxon.B.; Oxon.R.i.; Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.
- C. S. Mem.** ..... Memoirs and Proceedings of the Chemical Society of London. London. 1841—48. [Continued as: The Quarterly Journal, 1849—] B.M.; Camb.P.S.; Chem.S.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Geol.S.; Glasg.P.S.; Glasg.U.i.; N.H.M.; Oxon.B.(R.); Pharm.S.; P.O.; R.S.; S.K.; U.C.L.
- C. S. P.** ..... Proceedings of the Chemical Society. London. 1885— B.M.; Camb.P.S.; Camb.U.i.; Chem.S.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.i.; Geol.M.i.; Glasg.U.; N.H.M.i.; Oxon.R.; Pharm.S.; P.O.; R.S.; S.K.; U.C.L.
- Cuyper Ev. Un.** ..... Revue Universelle des Mines, de la Métallurgie, etc.; de Cuyper. Paris, Liège. 1857— B.M.; Camb.U.; Dub.R.I.A.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; N.H.M.; P.O.; S.K.  
See **Ev. Un. Mines.**
- C. Ztg.** ..... Chemiker-Zeitung. Central-Organ für Chemiker, Apotheker, Techniker, Ingenieure, Fabrikanten. Cöthen. 1877— Chem.S.i.; P.O.i.; S.K.i.
- Cztg. Opt.** ..... Central-Zeitung für Optik und Mechanik. Leipzig. 1880— Edinb.U.i.; P.O.i.; R.S.i.
- D. Alpvr. Z.** ..... Zeitschrift des Deutschen [und des Oesterreichischen] Alpenvereins. München. 1870— B.M.; Camb.U.; Oxon.B.; R.Geogr.S.
- Danzig Schr.** ..... Schriften der Naturforschenden Gesellschaft in Danzig. Danzig. 1863— [Continuation of: Neueste Schriften, etc., 1820—62.] Camb.P.S.; Camb.U.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.R.i.; R.S.; S.K.i.
- Darmst. Notb.** ..... Notizblatt des Vereins für Erdkunde und verwandte Wissenschaften zu Darmstadt und des Mittelrheinischen Geologischen Vereins. Darmstadt. 1855— B.M.; Geol.M.; Geol.S.; Glasg.P.S.i.; N.H.M.i.; R.Geogr.S.; R.S.i.; S.K.
- Dax S. Borda Ml.** ..... Bulletin de la Société de Borda à Dax. Dax. 1876— N.H.M.; U.C.L.i.
- D. St. Ga. B.** ..... Berichte der Deutschen Botanischen Gesellschaft. Berlin. 1868— B.M.; Camb.U.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; Pharm.S.; R.S.; S.K.; U.C.L.
- D. C. Ga. B.** ..... Berichte der Deutschen Chemischen Gesellschaft. Berlin. 1868— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.; Glasg.P.S.; Glasg.U.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.  
See **Berl. B.**
- Delft Né. Pol. A.** ..... Annales de l'École Polytechnique de Delft. Leide.

## List of Serial Publications

- 1885—97. Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Math.S.; R.A.S.; R.S.; S.K.  
**Denison Un. Sc. Lb. BU.** Bulletin of the Scientific Laboratories of Denison University. Granville, Ohio.
- 1885— B.M.; Camb.P.S.; Dub.R.I.A.; Edinb.R.S.; N.H.M.; P.O.; S.K.i.  
**Der NZ** ..... Der Naturforscher. Halle.
- 1774—1804. B.M.; Camb.U.; Geol.S.i.; Glasg.P.S.i.; Linn.S.; N.H.M.; R.S.i.; S.K.  
**Des Moines Anal.** ..... The Analyst: a monthly Journal of Pure and Applied Mathematics. Des Moines, Iowa.
- 1874—88. Camb.U.; Edinb.R.S.; R.S.  
**Devon. As. T.** ..... Reports and Transactions of the Devonshire Association for the Advancement of Science, Literature, and Art. Plymouth, London.
- 1862— Camb.U.i.; Geol.M.; Geol.S.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.; R.S.; S.K.  
**D. Gl. Gs. Z.** ..... Zeitschrift der Deutschen Geologischen Gesellschaft. Berlin.
- 1849— B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.U.i.; N.H.M.; Oxon.R.; R.S.i.; S.K.i.  
**D. Gs. Ootas. Mt.** ..... Mittheilungen der Deutschen Gesellschaft für Natur- und Völkerkunde Ostasiens. Yokohama.
- 1873— B.M.; Edinb.R.S.i.; Geol.S.i.; R.Geogr.S.; S.K.  
**Dijon Ac. Mm.** ..... Mémoires de l'Académie des Sciences, Arts, et Belles-lettres de Dijon. Dijon.
- Dijon Ac. Sc. Mm.** .....  
**Dijon Mm. Ac.** ..... { 1769— B.M.i.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.i.; Geol.S.i.; N.H.M.; Oxon.B.i.; R.A.S.; R.C.Surg.i.; R.Geogr.S.i.; R.S.i.; S.K.i.
- Séances publiques de l'Académie des Sciences, Arts, et Belles-lettres de Dijon. Dijon.  
**Dijon Sé. Ac.** ..... 1810—29. B.M.i.; N.H.M.
- Dingler** ..... Polytechnisches Journal; Dingler. Stuttgart.
- 1820— B.M.; Camb.U.; Chem.S.i.; Dub.N.L.I.i.; Dub.R.C.S.i.; Dub.R.D.S.i.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; P.O.; R.S.i.; S.K.  
**D. Meere Jbr.** ..... Jahresbericht der Commission zur Wissenschaftlichen Untersuchung der Deutschen Meere in Kiel. Berlin.
- 1871—93. [*Continued as:* Wissenschaftliche Meeresuntersuchungen, etc., 1896—] Camb.U.; Edinb.R.S.i.; Glasg.P.S.i.; Linn.S.; M.O.; N.H.M.; Oxon.R.; R.Geogr.S.i.; R.S.i.; S.K.  
**D. ML Gs. Nb.** ..... Nachrichtenblatt der Deutschen Malakozologischen Gesellschaft. Frankfurt am Main.
- 1869— B.M.; Camb.U.; Glasg.P.S.i.; N.H.M.  
**D. Mth. Vr. Jbr.** ..... Jahresbericht der deutschen Mathematiker-Vereinigung. Berlin, Leipzig.
- 1890— Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Math.S.i.; Oxon.B.; R.S.  
**D. NZ B.** ..... Bericht über die Versammlung der Deutschen Naturforscher und Aerzte.
- 1822—83. Irregular, *see* Tageblatt. Camb.U.i.; Geol.S.i.; N.H.M.i.; Oxon.R.i.; R.C.Surg.i.; R.S.i.; S.K.i.  
*See D. NZ Vsm. B.*  
**D. NZ Festschr.** ..... Festschrift für die 59. Versammlung Deutscher Naturforscher und Aerzte. Berlin.
1886. Dub.R.I.A.; N.H.M.; Oxon.R.; S.K.  
**D. NZ Tbl.** ..... Tageblatt der... Versammlung Deutscher Naturforscher und Aerzte.
- 1836—89. Irregular, *see* B. and Vh. Camb.U.; Geol.S.i.; N.H.M.; Oxon.R.i.; R.C.Surg.i.  
**D. NZ Vh.** ..... Verhandlungen der Gesellschaft Deutscher Naturforscher und Aerzte. Leipzig.
- 1890— [*Continuation of:* Bericht, Tagebl. etc., 1822—89.] Camb.U.; N.H.M.; Oxon.R.; R.C.Surg.  
*See D. NZ B.*  
**Dn. Vd. Selak. Skr.** ..... Det Kongelige Danske Videnskabernes Selskabs Skrifter. Kiöbenhavn.
- 1801—18. B.M.; Camb.P.S.i.; Camb.U.; Edinb.R.S.; N.H.M.; Oxon.B.; R.S.  
*See Kiöb. Dn. Vd. Selak. Skr.*

## List of Serial Publications

- Donders Arch.** ..... Archiv für die Holländischen Beiträge zur Natur- und Heilkunde; Donders. Utrecht. 1858—64. [*Continued as*: Nederlandsch Archief voor Genees- en Natuurkunde, 1865—70.] B.M.; Camb.U.; N.H.M.; R.C.Surg.; R.S.
- Donders Ndl. Gast. Oogl. Va.** Jaarlijksch Verslag betrekkelijk de Verpleging en 't Onderwijs in het Nederlandsch Gasthuis voor Ooglijders; Donders. Utrecht. 1860—85. [*Continued as*: Nederlandsch Gasthuis voor Behoeftige en Minvermogene Ooglijders te Utrecht. Verslag, 1885—] Glasg.P.S.i.; R.S.
- Dorpat Sb.** ..... Sitzungsberichte der Naturforscher-Gesellschaft zu Dorpat. Dorpat. 1853— Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.; N.H.M.; R.S.i.; S.K.i.
- Dorpat Schr.** ..... Schriften herausgegeben von der Naturforscher-Gesellschaft bei der Universität Dorpat. Dorpat. 1884— B.M.; Camb.U.; Edinb.R.S.i.; N.H.M.; Oxon.R.
- Dorset FC. P.** ..... Proceedings of the Dorset Natural History and Antiquarian Field Club. Sherborne. 1877— B.M.; Camb.P.S.; Camb.U.i.; Geol.S.i.; Linn.S.; N.H.M.; Oxon.B.i.
- Douai Mm. S. Ag.** ..... Mémoires de la Société d'Agriculture, de Sciences et d'Arts [du Département du Nord] séant à Douai. Douai. 1826—89. B.M.; Camb.U.i.; Dub.T.C.i.; Oxon.B.; R.S.i.
- Doubs S. Mm.** ..... Mémoires et Comptes Rendus de la Société [Libre] d'Émulation du Doubs. Besançon. 1841— B.M.; N.H.M.i.
- D. Pa. Ga. Vh.** ..... Verhandlungen der Deutschen Physikalischen Gesellschaft. Leipzig. 1899— [*Continuation of*: Verhandlungen der Physikalischen Gesellschaft in Berlin, 1882—98.] Camb.P.S.; Camb.U.; Edinb.R.S.; Edinb.U.i.; Glasg.U.; N.H.M.; Oxon.B.(R.); P.O.; R.A.S.; R.S.; S.K.; U.C.L.i.
- Dresden Ausz. Protokoll.** Auszüge aus den Protokollen der Gesellschaft für Natur- und Heilkunde in Dresden. Dresden. 1832—34. B.M.; Glasg.P.S.i.; R.S.
- Dresden Erdk. Jbr.** ..... Jahresbericht des Vereins für Erdkunde zu Dresden. Dresden. 1865— B.M.; Geol.S.i.; Glasg.P.S.i.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.i.; S.K.
- Dresden Isis Festschr.** ..... Festschrift der Naturwissenschaftlichen Gesellschaft Isis in Dresden. Dresden. 1885. B.M.; Dub.R.I.A.; Geol.S.; Glasg.P.S.i.; N.H.M.; S.K.
- Dresden Isis Sb.** ..... Sitzungsberichte der Naturwissenschaftlichen Gesellschaft Isis in Dresden. Dresden. 1861— Camb.U.i.; Dub.T.C.; Geol.S.; N.H.M.; S.K.  
*See Dresden Sb. Isis.*
- Dresden Jbr. Nt. Heilk.** Jahresberichte [Sitzungsberichte] der Gesellschaft für Natur- und Heilkunde. Dresden. 1858— Glasg.P.S.i.; R.C.Surg.i.; R.S.i.; S.K.i.  
*See Dresden Sb. Nt. Heilk.*
- Dresden Lndw. V.-St.** ..... Die landwirthschaftlichen Versuchs-Stationen. Organ für wissenschaftliche Forschungen auf dem Gebiete der Landwirtschaft. Dresden, Chemnitz. 1859— B.M.i.; Camb.U.; Chem.S.i.; Glasg.U.i.; Oxon.B.; P.O.i.; R.S.i.  
*See Lndw. V.-St.*
- Dresden Sb. Isis** ..... *See Dresden Isis Sb.*
- Dresden Sb. Nt. Heilk.** ..... *See Dresden Jbr. Nt. Heilk.*
- Dubl. J. Md. C. Sc.** ..... Dublin Journal of Medical and Chemical Science. Dublin. 1832—45. [*Continued as*: The Dublin [Quarterly] Journal of Medical Science, 1846—] B.M.; Camb.U.i.; Dub.N.L.I.i.; Dub.R.D.S.i.; Dub.T.C.i.; Pharm.S.i.; R.C.Surg.
- Dubl. J. Md. Sc.** ..... The Dublin [Quarterly] Journal of Medical Science. Dublin. 1846— [*Continuation of*: Dublin Journal of Medical and Chemical Science, 1832—45.] B.M.; Camb.U.i.; Dub.N.L.I.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; Oxon.B.(R.); Pharm.S.i.; P.O.; R.C.Surg.; U.C.L.i.
- Dubl. QJ. Md. Sc.** ..... }  
Journal of the Royal Dublin Society. Dublin. 1856—78. B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Geol.M.;

## List of Serial Publications

- Geol.S.; Glasg.U.i.; I.CE.i.; Linn.S.; M.O.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.
- Dubl. S. J.**..... Transactions and Journal of the Dublin Society. Dublin. 1799—1810. B.M.; Dub.N.L.I.; Dub.R.D.S.; Dub.T.C.; Geol.S.i.; N.H.M.; Oxon.B.i.; R.S.; S.K.  
*See* **Dubl. S. T.**
- Dubl. S. Sc. P.**..... The Scientific Proceedings of the Royal Dublin Society. Dublin. 1877— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.; Dub. R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.; I.CE.; Linn.S.; Math.S.i.; M.O.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Dubl. S. Sc. T.**..... The Scientific Transactions of the Royal Dublin Society. Dublin. 1877— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.; Dub. R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.; I.CE.; Linn.S.; Math.S.; M.O.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Dubl. S. T.**..... *See* **Dubl. S. J.**
- Durham Un. Ph. S. P.**... Proceedings of the University of Durham Philosophical Society. Newcastle-upon-Tyne. 1900— Camb.P.S.; Camb.U.i.; Edinb.R.S.; Geol.S.i.; Glasg.P.S.i.; N.H.M.; Oxon.B.; S.K.i.
- D. Vjschr. Gesundheitsl.**..... Deutsche Vierteljahrsschrift für öffentliche Gesundheitspflege. Braunschweig. 1869— B.M.; Camb.U.i.; Glasg.P.S.i.; I.CE.i.; Oxon.R.; U.C.L.i.
- D. Z. Thmd.**..... Deutsche Zeitschrift für Thiermedizin und vergleichende Pathologie. Leipzig. 1875— Camb.U.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.
- Eastbourne NH. S. Pp. (& T.)**..... Papers (Transactions) of the Eastbourne Natural History Society with Annual Report. Eastbourne. 1869— Geol.S.i.; N.H.M.i.; R.S.i.; S.K.i.
- Éclair. Élect.**..... L'Éclairage Électrique. Paris. 1894— B.M.; Glasg.U.i.; I.CE.; P.O.
- Edinb. FC. T.**..... Transactions of the Edinburgh Naturalists' Field Club. Edinburgh. 1881— Camb.U.; Glasg.P.S.i.; Linn.S.i.; N.H.M.
- Edinb. Gl. S. T.**..... Transactions of the Edinburgh Geological Society. Edinburgh. 1868— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.i.; Geol.M.; Geol.S.; Glasg.P.S.; N.H.M.; P.O.; R.Geogr.S.; R.S.; U.C.L.
- Edinb. J. Med. Sc.**..... Edinburgh Journal of Medical Science. Edinburgh. 1826—27. B.M.; Camb.U.; Dub.T.C.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; R.C.Surg.
- Edinb. J. Nat. Gg. Sc.**..... The Edinburgh Journal of Natural and Geographical Science. Edinburgh. 1830—31. B.M.; Camb.U.; Edinb.R.S.; Edinb.U.; Linn.S.; N.H.M.; Oxon.B.i.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.
- Edinb. J. Sc.**..... The Edinburgh Journal of Science, exhibiting a view of the progress of discovery in Natural Philosophy, Chemistry, Mineralogy, Geology, Botany, etc.; David Brewster. Edinburgh. 1824—1832. [*Continued in:* The London and Edinburgh Philosophical Magazine, etc., 1832—] B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.; M.O.i.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.; R.C.Surg.; R.S.; S.K.
- Edinb. M. J. Med. Sc.**... London and Edinburgh Monthly Journal of Medical Science. London, Edinburgh. 1841—55. [*Continued as:* Edinburgh Medical Journal, 1855—] B.M.; Glasg.P.S.i.; Pharm.S.i.; R.C.Surg.
- Edinb. Mem. Wern. S.**... Memoirs of the Wernerian Natural History Society. Edinburgh. 1808—39. B.M.; Camb.U.i.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.  
*See* **Edinb. Wern. S. Mem.**
- Edinb. Math. S. P.**..... Proceedings of the Edinburgh Mathematical Society. London, Edinburgh.

## List of Serial Publications

- 1893— B.M.; Camb.P.S.; Camb.U.; Edinb.R.S.; Edinb.U.;  
Glasg.U.; Math.S.; R.S.i.
- Edinb. N. Ph. J.** ..... The Edinburgh New Philosophical Journal, exhibiting a view of the  
progressive Improvements, etc. in the Sciences, etc.; Robert  
Jameson. Edinburgh.
- 1826—64. [*Continuation of:* The Edinburgh Philosophical Journal,  
1819—26.] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.T.C.i.;  
Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.;  
Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.;  
R.Geogr.S.i.; R.S.; S.K.
- Edinb. Ph. J.** ..... The Edinburgh Philosophical Journal, exhibiting a view of the  
Progress of Discovery in Natural Philosophy, etc.; David Brewster  
and Robert Jameson. Edinburgh.
- 1819—26. [*Continued as:* The Edinburgh New Philosophical  
Journal, 1826—64.] B.M.; Camb.P.S.; Camb.U.; Chem.S.;  
Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.; Glasg.U.;  
I.CE.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.;  
R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Edinb. P. Ph. S.** ..... Proceedings of the Royal Physical Society of Edinburgh. Edinburgh.
- 1854— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;  
Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.; Linn.S.;  
N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.S.; S.K.; U.C.L.i.
- Edinb. P. R. S.** ..... Proceedings of the Royal Society of Edinburgh. Edinburgh.
- Edinb. R. S. F.** ..... 1845— B.M.i.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.;  
Edinb.R.S.; Edinb.U.; Geol.M.i.; Geol.S.; Glasg.P.S.; Glasg.U.;  
I.CE.; Linn.S.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.i.; Oxon.R.;  
Pharm.S.i.; P.O.i.; R.A.S.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.;  
U.C.L.
- Edinb. R. S. T.** ..... Transactions of the Royal Society of Edinburgh. Edinburgh.
- 1788— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.; Dub.  
R.I.A.; Edinb.R.S.; Edinb.U.; Geol.M.i.; Geol.S.; Glasg.P.S.;  
Glasg.U.; I.CE.; Linn.S.; Math.S.i.; N.H.M.; Oxon.B.i.;  
Oxon.R.; P.O.i.; R.A.S.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.;  
U.C.L.
- See Edinb. T. R. S.*
- Edinb. Sc. S. Arts F.** ..... Transactions of the Royal Scottish Society of Arts. Edinburgh.
- Edinb. Sc. S. Arts T.** ..... 1841— B.M.i.; Camb.U.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.;  
Glasg.P.S.; Glasg.U.; I.CE.; P.O.; R.S.; S.K.
- See Edinb. T. Sc. S. Arts and Sc. S. Arts T.*
- Edinb. T. R. S.** ..... *See Edinb. R. S. T.*
- Edinb. T. Sc. S. Arts** ..... *See Edinb. Sc. S. Arts F. and Sc. S. Arts T.*
- Edinb. Wern. S. Mem.** ..... *See Edinb. Mem. Wern. S.*
- Educ. Times** ..... The Educational Times, and Journal of the College of Preceptors.  
London.
- 1847— B.M.; Camb.P.S.i.; Camb.U.i.; Dub.N.L.I.; Glasg.U.i.;  
Math.S.i.; Oxon.B.i.; Oxon.R.i.; R.S.i.; S.K.i.
- Elect.** ..... The Electrician. London.
- 1862— B.M.i.; Camb.P.S.i.; Camb.U.i.; Dub.N.L.I.i.; Dub.  
R.C.S.i.; Edinb.R.S.i.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.;  
I.CE.i.; Oxon.B.i.; Oxon.R.i.; P.O.; R.S.i.; S.K.; U.C.L.i.
- Elect. Rev.** ..... The Electrical Review. London.
- 1892— [*Continuation of:* The Telegraphic Journal and Electrical  
Review, 1872—91.] B.M.; Camb.U.; Dub.N.L.I.; Edinb.U.;  
Glasg.P.S.; Glasg.U.; I.CE.; P.O.; R.S.; S.K.
- Electr. S. F.** ..... The Transactions and Proceedings of the London Electrical Society.  
London.
- Electr. S. T.** ..... 1837—40. [*Continued as:* Proceedings, 1841—43.] B.M.; Camb.U.i.;  
Glasg.P.S.i.; I.CE.i.; Oxon.B.; Pharm.S.; P.O.; R.S.; S.K.
- Elekttech. Z.** ..... Elektrotechnische Zeitschrift. Berlin, München.
- 1880— B.M.; Glasg.U.; I.CE.; P.O.; S.K.i.
- Emden Wf. Ges. Jbr.** ..... Jahresbericht.....der Naturforschenden Gesellschaft in Emden.  
Emden.
- 1837— Dub.R.I.A.; R.S.
- E. Mag.** ..... The Entomological Magazine. London.
- 1833—38. B.M.; Camb.U.; Edinb.U.i.; Geol.S.; Glasg.U.; Linn.S.;  
N.H.M.; Oxon.B.
- Eng. S. T.** ..... Transactions of the Society of Engineers. London.

## List of Serial Publications

- 1860— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Glasg.P.S.i.;  
Glasg.U.i.; I.CE.; Oxon.B.; P.O.; R.S.i.; U.C.L.
- Ens. Mth.**..... L'Enseignement Mathématique. Revue Internationale. Paris.  
1899— Math.S.; S.K.
- Erdm. J. Fr. C.** ..... Journal für praktische Chemie; Erdman, etc. Leipzig.  
1834— [Continuation of: Journal für technische und ökonomische  
Chemie, 1828—33.] B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.;  
Dub.R.C.S.i.; Dub.R.D.S.i.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.;  
N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.;  
S.K.; U.C.L.i.
- See J. Fr. C.*
- Erdm. J. Tech. C.** ..... Journal für technische und ökonomische Chemie; Erdman. Leipzig.  
1828—33. [Continued as: Journal für praktische Chemie, 1834—]  
B.M.; Chem.S.; N.H.M.; P.O.; R.S.; S.K.
- Erfurt Ak. Jb.**..... Jahrbücher der königlichen Akademie gemeinnütziger Wissen-  
schaften zu Erfurt. Erfurt.  
1860— B.M.; N.H.M.
- Erlang. Ab.** ..... Abhandlungen der Physikalisch-Medicinischen Societät in Erlangen.  
Frankfurt-am-Main.  
1810—12. B.M.; Glasg.P.S.i.; R.C.Surg.; R.S.; U.C.L.i.
- Erlang. Pa. Md. S. Sb.** ... Sitzungsberichte der Physikalisch-Medicinischen Societät zu Er-  
langen. Erlangen.
- Erlang. Sb. Pa. Md. S.** ... } 1864— B.M.; Camb.P.S.; Dub.R.D.S.; Edinb.R.S.i.; Glasg.U.i.;  
Linn.S.i.; Math.S.i.; N.H.M.; R.C.Surg.i.; R.S.i.
- Erlenmeyer Z.** ..... Zeitschrift für Chemie und Pharmacie etc.; Erlenmeyer. Erlangen,  
Heidelberg.  
1860—64. [Continued as: Zeitschrift für Chemie, 1865—71.] B.M.;  
Camb.U.; Chem.S.; N.H.M.; Oxon.R.i.; S.K.i.
- Erman Arch. Ra.** ..... Archiv für wissenschaftliche Kunde von Russland; Erman. Berlin.  
1841—67. B.M.; Camb.U.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.i.;  
S.K.
- Essex I. Bul.**..... Bulletin of the Essex Institute. Salem (Mass.).  
1869— [Continuation of: Proceedings, etc., 1848—68.] Camb.P.S.;  
Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.i.; Linn.S.i.; N.H.M.;  
Oxon.R.i.; P.O.i.; R.Geogr.S.; R.S.; S.K.
- Essex I. F.** ..... Proceedings of the Essex Institute. Salem (Mass.).  
1848—68. [Continued as: Bulletin, etc., 1869—] B.M.i.; Camb.P.S.;  
Dub.R.I.A.; Edinb.R.S.i.; Linn. S.i.; N.H.M.; Oxon.R.i.; R.S.;  
S.K.
- Essex Natist.** ..... The Essex Naturalist; being the Journal of the Essex Field Club.  
Buckhurst Hill.  
1887— [Continuation of: Transactions of the Essex Field Club,  
1880—86.] B.M.; Camb.P.S.; Camb.U.; Edinb.R.S.; Geol.M.;  
Geol.S.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.B.; R.S.;  
U.C.L.
- Eure Rec. S. Ag.**..... } Recueil de la Société d'Agriculture, Sciences, Arts, et Belles-Lettres  
du département de l'Eure. Evreux.
- Eure S. Ag. Rec.** ..... } 1830—39. B.M.; Camb.U.; Oxon.B.; R.S.
- Évk.** ..... A'Magyar Tudós Társaság' Evkönyvei. Pest.  
1833—46.  
A'Magyar Tudományos Akademia Évkönyvei. Budá.  
1860—89. B.M.; Edinb.R.S.i.; Geol.S.i.; N.H.M.; Oxon.B.;  
R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- See Mag. Tud. Ak. Évk.*
- Exner Rpm.**..... Repertorium der Physik; Exner. München, Leipzig.  
1883—91. [Continuation of: Repertorium für physikalische Technik,  
etc.; Carl, 1865—82.] B.M.; Camb.U.i.; Dub.N.L.I.i.; Edinb.U.;  
I.CE.i.; Oxon.R.; P.O.; R.S.; S.K.
- Fechner Ob.** ..... Centralblatt für Naturwissenschaften und Anthropologie; Fechner.  
Leipzig.  
1853—54. B.M.; Glasg.P.S.i.; N.H.M.
- Fed. I. Min. E. T.** ..... Transactions of the Federated Institution of Mining Engineers.  
Newcastle-upon-Tyne.  
1869—98. [Continued as: Transactions of the Institution of Mining  
Engineers, 1898—] Camb.U.; Edinb.R.S.i.; Geol.M.; Geol.S.;  
Glasg.P.S.; Glasg.U.; I.CE.; Oxon.B.; Oxon.R.i.; P.O.; S.K.

## List of Serial Publications

- Férussac Bul. Sc. Mth.** ... Bulletin des Sciences Mathématiques, Astronomiques, Physiques et Chimiques; de Férussac. Paris.  
1824—31. B.M.; Edinb.U.i.; Geol.S.; Glasg.U.i.; Oxon.R.; P.O.; R.C.Surg.; U.C.L.
- Férussac Bul. Sc. Mt.** ... Bulletin des Sciences Naturelles et de Géologie; de Férussac. Paris.  
1824—31. B.M.; Geol.S.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.B.; P.O.; R.C.Surg.; R.S.
- Finist. S. Sc. Bul.** ..... Bulletin de la Société d'Études Scientifiques du Finistère. Morlaix.  
1879— N.H.M.
- Firenze Ac. Georg. At.** ... Atti della R. Accademia economico-agraria dei Georgofili. Firenze.  
1817— [Continuation of: Atti della (Real) Società Economica di Firenze ossia de' Georgofili, 1791—1812.] B.M.; Camb.U.; Dub.T.C.i.; Edinb.R.S.i.; Oxon.B.  
*See Firenze At. Ac. Georg.*
- Firenze A. Ma. Fis.** ..... Annali del R. Museo di Fisica e Storia Naturale. Firenze.  
1866. Glasg.P.S.i.; M.O.; N.H.M.; Oxon.B.i.; R.A.S.; R.S.; S.K.
- Firenze A. Ma. Imp.** ... Annali del Museo Imperiale di Fisica e Storia Naturale di Firenze.  
Firenze.  
1808—10. B.M.; Camb.U.i.; M.O.; N.H.M.; Oxon.B.; R.A.S.; R.S.i.; S.K.
- Firenze At. Ac. Georg.**... *See Firenze Ac. Georg. At.*
- Firenze R. I. Pb.**..... Pubblicazioni del R. Istituto di Studi Superiori Pratici e di Perfezionamento in Firenze. Sezione di Scienze Fisiche e Naturali.  
Firenze.  
1877— B.M.; Glasg.P.S.i.; N.H.M.; R.S.
- Firenze S. Georg. At.** ... Atti della (Real) Società Economica di Firenze ossia de' Georgofili.  
Firenze.  
1791—1812. [Continued as: Atti della R. Accademia economico-agraria dei Georgofili, 1817—] B.M.; Camb.U.
- Flora** ..... Flora, oder Allgemeine Botanische Zeitung; herausgegeben von der Königl. Bayer. Botanischen Gesellschaft. Regensburg.  
1818— Camb.U.i.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.; N.H.M.; R.S.i.; S.K.; U.C.L.i.
- Föld Kézl.** ..... Földtani Közöny. Havi folyóirat kiadja a Magyarhoni Földtani Társulat. (Geologische Mittheilungen.) Zeitschrift der Ungarischen Geologischen Gesellschaft. Budapest.  
1872— B.M.; Camb.U.i.; Geol.M.; Geol.S.; N.H.M.; R.S.i.; S.K.i.
- Forsch. Ag.-Pa.** ..... Forschungen auf dem Gebiete der Agrikultur-Physik. Heidelberg.  
1878—98. Chem.S.; P.O.
- Förster Al. Baustg.** ..... Allgemeine Bauzeitung; Förster. Wien.  
1836— B.M.; Camb.U.; I.CE.i.; P.O.
- Franklin I. J.** ..... Journal of the Franklin Institute of the State of Pennsylvania.  
Philadelphia.  
1828— B.M.; Camb.U.; Chem.S.i.; Dub.R.I.A.; Geol.S.i.; Glasg.P.S.i.; I.CE.; M.O.i.; Oxon.B.; P.O.; R.A.S.i.; R.Geogr.S.; R.S.; U.C.L.i.
- Fr. An. Mét.** ..... Annuaire Météorologique de la France. Paris.  
1849—52. [Continued as: Annuaire de la Société Météorologique de France, 1853—] B.M.; Camb.U.; Dub.T.C.; Glasg.U.i.; M.O.; R.S.  
*See An. Mét. Fr.*
- Fr. Cg. Sc.** ..... Sessions des Congrès Scientifiques de France.  
1833—79. B.M.; Camb.U.; N.H.M.; R.C.Surg.i.
- Freiberg Jb. Berg.-Hm.** ..... Jahrbuch für den Berg- und Hüttenmann. Herausg. von der Königl. Berg-Akademie zu Freiberg. Freiberg.  
1837—72. [Continued as: Jahrbuch für das Berg- und Hüttenwesen, 1873—] B.M.; Glasg.P.S.i.; N.H.M.; P.O.i.; R.S.i.; S.K.i.
- Freiburg B.** ..... Berichte über die Verhandlungen der Naturforschenden Gesellschaft zu Freiburg i. B. Freiburg i. B.  
1855— B.M.; Camb.U.i.; Dub.R.I.A.; Linn.S.i.; N.H.M.; Oxon.R.; R.C.Surg.i.; R.S.; S.K.
- Fresenius Z.**..... Zeitschrift für Analytische Chemie; Fresenius. Wiesbaden.  
1862— B.M.; Camb.U.; Chem.S.; Dub.N.L.I.; Edinb.U.i.; Glasg.P.S.; N.H.M.; Oxon.R.; Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.
- Frankf. a. M. Ph. Vr. Jbr.**... } Jahresbericht des Physikalischen Vereins zu Frankfurt am Main.  
**Frankf. Jbr. Ph. Vr.** } Frankfurt am Main.  
1838— B.M.i.; Glasg.U.i.; M.O.i.; P.O.i.; R.S.i.; S.K.i.



## List of Serial Publications

- Frankf. Pa. Vr. Jb.**..... Jahrbuch zur Verbreitung Naturwissenschaftlicher Kenntnisse, veranstaltet vom Physikalischen Vereine zu Frankfurt. Frankfurt.
- Froriep Not.** ..... 1831. Glasg.P.S.i.; R.S.; S.K.  
Notizen aus dem Gebiete der Natur- und Heilkunde; Froriep. Erfurt, Weimar.
- Fr. S. Ag. Bil.**..... 1821—62. B.M.i.; Camb.U.i.; Glasg.U.i.; N.H.M.; Oxon.R.i.; R.C.Surg.; R.S.i.  
Bulletin des Séances de la Société (Centrale) d'Agriculture de France. Paris.
- Fr. S. Ag. Mm.** ..... 1837— P.O.i.  
Mémoires d'Agriculture, d'Économie rurale et domestique publiés par la Société d'Agriculture. Paris.
- Fr. S. St. Bil.** ..... 1801— B.M.; Edinb.R.S.i.; Oxon.B.  
Bulletin de la Société Botanique de France. Paris.
- Fr. S. St. Bil.** ..... 1854— B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.i.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; Pharm.S.i.; S.K.  
*See Far. Bil. S. St.*
- Fr. S. Mét. An.** ..... Annuaire de la Société Météorologique de France. Paris.  
1858— [Continuation of: Annuaire Météorologique de la France, 1849—52.] B.M.; Camb.U.; Dub.T.C.i.; Glasg.U.i.; M.O.
- Fr. S. Mét. N. Mét.** ..... Nouvelles Météorologiques publiées sous les auspices de la Société Météorologique de France. Paris.
- Fr. S. Min. Bil.** ..... 1868—76. B.M.i.; M.O.; R.S.i.  
Bulletin de la Société Minéralogique de France. Meulan, Paris.
- Fr. S. Z. Bil.** ..... 1878— B.M.; Dub.T.C.; Geol.M.; Geol.S.; N.H.M.; Oxon.R.; R.S.; S.K.  
Bulletin de la Société Zoologique de France. Paris.
- Fachr. Med.** ..... 1876— B.M.; Camb.U.; Edinb.R.S.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.R.i.; S.K.  
Fortschritte der Medicin. Berlin.
- Fachr. Math.** ..... 1883— Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Oxon.B.; R.C.Surg.  
Jahrbuch über die Fortschritte der Mathematik. Berlin.
- Fachr. Pa.** ..... 1868— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; Math.S.; Oxon.R.; R.S.; U.C.L.  
Die Fortschritte der Physik. Berlin.
- Fachr. Röntgenstr.** ..... 1845— Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Edinb.U.; Glasg.U.; I.CE.i.; Oxon.B.(R.); P.O.; R.A.S.i.; R.S.; S.K.; U.C.L.  
Fortschritte auf dem Gebiete der Röntgenstrahlen. Hamburg.
- Gand. A. Ac.**..... 1897— Glasg.P.S.i.; Oxon.R.; R.S.; S.K.
- G. Acad.** ..... Annales Academiæ Gandavensis. Gandavi (Ghent).  
1819—31. B.M.; Camb.U.; N.H.M.; Oxon.B.; R.S.
- Gard Aperçu Tr.** ..... Giornale Arcadico di Scienze, etc. Roma.  
1819—71. B.M.; N.H.M.; Oxon.B.
- Gard Chron.** ..... Notice [ou Aperçu analytique] des Travaux de l'Académie Royale du Gard. Nîmes.  
1807—? B.M.; Camb.U.; Oxon.B.  
*See Gard Not. Tr. Ac.*
- Gard Not. Tr. Ac.** } ..... The Gardener's Chronicle. London.  
**Gard Tr. Ac.** } ..... 1841— Camb.U.; Dub.N.L.I.i.; Dub.T.C.i.; Edinb.U.i.; Linn.S.; N.H.M.; Oxon.B.; P.O.; S.K.i.
- Gauss Resultate** ..... *See Gard Aperçu Tr.*  
Resultate aus den Beobachtungen des Magnetischen Vereins; Gauss und Weber. Göttingen, Leipzig.
- Gehlen J.** ..... 1837—42. B.M.; Camb.U.; Chem.S.; R.S.  
Journal für die Chemie und Physik; Gehlen. Berlin.
- Gen. Bil. I. Mt.** ..... 1806—10. B.M.; Edinb.R.S.; Edinb.U.i.; Glasg.U.; N.H.M.; Oxon.R.; R.S.  
Bulletin de l'Institut National Gènevois. Genève.
- Gen. I. Mt. Bil.** ..... 1853— B.M.; Camb.U.; Dub.R.D.S.; N.H.M.; Oxon.B.i.; P.O.i.; R.S.  
*See Gen. I. Mt. Bil.*

## List of Serial Publications

- Gén. Civ.** ..... Le Génie Civil. Revue Générale des Industries Françaises et Étrangères, etc. Paris.  
1880— B.M.; I.CE.; P.O.; S.K.
- Gen. I. Mt. Ill.** ..... See **Gen. Ill. I. Mt.**
- Gen. I. Mt. Mem.** ..... Mémoires de l'Institut National Gènevois. Genève.  
1854— B.M.; Camb.U.; Dub.R.D.S.; N.H.M.i.; Oxon.B.; R.S.; S.K.i.
- Gen. Mem. S. Pa.** ..... Mémoires de la Société de Physique et d'Histoire Naturelle de Genève. Genève.  
1821— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.S.; Glasg.U.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.i.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.; R.S.; U.C.L.i.  
See **Gen. S. Pa. Mem.**
- Genova Mem. I. Ligure** ... Memorie dell' Istituto Ligure. Genova.  
1806. B.M.; Camb.U.; R.S.
- Genova Mem. S. Md.** ..... Memorie della Società Medica di Emulazione di Genova. Genova.  
1802—04. R.C.Surg.
- Genova S. Lig. At.** ..... Atti della Società Ligustica di Scienze Naturali e Geografiche. Genova.  
1890— B.M.; N.H.M.; R.S.
- Gen. S. Pa. Mem.** ..... See **Gen. Mem. S. Pa.**
- Gergonne A. Mth.** ..... Annales de Mathématiques, pures et appliquées; Gergonne. Nîmes, Paris.  
1810—31. B.M.; Dub.T.C.; Edinb.U.i.; Glasg.U.i.; Oxon.B.(R.); R.A.S.i.; R.S.; U.C.L.
- Gg. J.** ..... The Geographical Journal. Including the Proceedings of the Royal Geographical Society. London.  
1893— [Continuation of: Proceedings, etc., 1857—92.] B.M.i.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.U.; I.CE.; Linn.S.; M.O.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Gg. Jb.** ..... Geographisches Jahrbuch. Gotha.  
1866— B.M.; Camb.U.; Edinb.U.i.; M.O.i.; N.H.M.i.; Oxon.B.; Oxon.R.; R.Geogr.S.; S.K.
- Gg. S. J.** ..... Journal of the Royal Geographical Society of London. London.  
1832—80. B.M.; Camb.P.S.i.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.; Linn.S.; M.O.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.; R.S.; S.K.
- Gg. S. P.** ..... Proceedings of the Royal Geographical Society of London. London.  
1857—92. [Continued as: The Geographical Journal, 1893—] Camb.P.S.i.; Camb.U.; Dub.T.C.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.; Linn.S.; M.O.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.A.S.i.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Giessen Oberh. Ges. B.** ... Berichte der Oberhessischen Gesellschaft für Natur- und Heilkunde. Giessen.  
1847— B.M.i.; Camb.P.S.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; P.O.i.; R.Geogr.S.i.; R.S.i.; S.K.
- Gilbert A.** ..... Annalen der Physik; Gilbert. Halle und Leipzig.  
1799—1824. [Continued as: Annalen der Physik und Chemie, 1824—] Camb.U.; Chem.S.; Edinb.U.; Glasg.U.i.; N.H.M.; Oxon.B.(R.); P.O.; R.C.Surg.; R.S.; S.K.
- Gill Tech. Micr. Rep.** ..... Gill's Technological [and Microscopic] Repository. London.  
1827—30. [Continuation of: The Technical Repository, 1822—27.] B.M.; Camb.U.i.; Edinb.R.S.; Glasg.P.S.i.; I.CE.; Oxon.B.; P.O.
- Gill Tech. Rep.** ..... The Technical Repository; Gill. London.  
1822—27. [Continued as: Gill's Technological [and Microscopic] Repository, 1827—30.] B.M.; Camb.U.; Edinb.R.S.i.; Glasg.U.i.; I.CE.i.; Oxon.B.; P.O.; R.S.; S.K.
- Glasg. I. Eng. T.** ..... Transactions of the Institution of Engineers [and Shipbuilders] in Scotland. Glasgow.  
1857— Camb.U.i.; Glasg.U.; I.CE.; P.O.; U.C.L.i.  
See **Glasg. T. I. Eng.**
- Glasg. Med. J.** ..... Glasgow Medical Journal. Glasgow.

## List of Serial Publications

- 1828—32; 1854— B.M.; Camb.U.; Dub.T.C.; Edinb.U.i.;  
Glasg.U.; Oxon.B.i.; Oxon.R.i.; Pharm.S.i.; R.C.Surg.;  
U.C.L.i.
- Glasg. Ph. S. F.** ..... {Proceedings of the [Royal] Philosophical Society of Glasgow. Glasgow.  
**Glasg. P. Ph. S.** ..... {1841— B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.;  
Edinb.R.S.; Geol.M.i.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.; I.CE.i.;  
N.H.M.; Oxon.B.; Pharm.S.i.; P.O.i.; R.A.S.; R.Geogr.S.i.;  
R.S.; S.K.; U.C.L.i.
- Glasg. T. I. Eng.** ..... See **Glasg. I. Eng. T.**  
**Gleanings Sc.** ..... Gleanings in Science. Calcutta.  
1829—31. B.M.; Edinb.R.S.i.; I.CE.; M.O.i.; N.H.M.; S.K.;  
U.C.L.i.
- Gl. Mg.** ..... The Geological Magazine or Monthly Journal of Geology. London.  
1864— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Geol.M.;  
Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.; Linn.S.; N.H.M.; Oxon.R.;  
P.O.i.; R.Geogr.S.; S.K.; U.C.L.
- Gl. S. F.** ..... Proceedings of the Geological Society of London. London.  
1826—45. [Continued in: The Quarterly Journal, etc., 1845—]  
B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Dub.R.D.S.;  
Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.;  
I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.A.S.; R.C.Surg.;  
R.Geogr.S.; R.S.; S.K.; U.C.L.
- Gl. S. QJ.** ..... The Quarterly Journal of the Geological Society of London. London.  
1845— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.;  
Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.;  
Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.C.Surg.;  
R.Geogr.S.; R.S.; S.K.; U.C.L.
- Gl. Sv. Min.** ..... Memoirs of the Geological Survey of Great Britain and of the  
Museum of Economic Geology in London. London.  
1846— Camb.U.; Dub.R.C.S.; Dub.T.C.; Edinb.R.S.; Edinb.U.;  
Geol.M.; Geol.S.; Glasg.U.i.; I.CE.; N.H.M.; Oxon.B.; Oxon.R.;  
P.O.; R.S.; S.K.; U.C.L.
- G. Mat.** ..... See **Min. Gl. Sv.**  
Giornale di Matematiche ad uso degli Studenti delle Università  
Italiane; Battaglini. Napoli.  
1863— B.M.; Camb.U.; Dub.R.C.S.i.; Dub.R.I.A.i.; Math.S.i.;  
Oxon.B.; R.S.; U.C.L.i.
- Görl. Ab.** ..... Abhandlungen der Naturforschenden Gesellschaft zu Görlitz. Görlitz.  
1827— B.M.; Camb.U.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; N.H.M.;  
R.S.; S.K.
- Götheb. Hndl.** ..... Götheborgs Kongl. Vetenskaps och Vitterhets Samhälles Handlingar.  
Götheborg.  
1850— B.M.; Camb.P.S.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.  
R.S.i.; N.H.M.; R.S.i.
- Götheb. N. Hndl.** ..... Nya Handlingar af Kongl. Wettenskaps och Witterhets Samhället i  
Götheborg. Götheborg.  
1808—22. Edinb.R.S.i.; Glasg.P.S.i.; R.S.
- Gött. Ab.** ..... Abhandlungen der k. Gesellschaft der Wissenschaften. Göttingen.  
1839— [Continuation of: Commentationes, etc., 1778—1837.] B.M.;  
Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Glasg.U.;  
Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.i.; R.S.; U.C.L.i.
- Gött. Cm.** ..... Commentationes Societatis Regiæ Scientiarum Gottingensis. Got-  
tingæ.  
1778—1808. B.M.i.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.  
U.i.; N.H.M.; Oxon.B.; R.C.Surg.; R.S.; U.C.L.  
Commentationes recentiores Societatis, etc. Gottingæ.  
1808—37. [Continued as: Abhandlungen, etc., 1838—] B.M.;  
Camb.U.; Edinb.R.S.i.; Glasg.U.i.; N.H.M.; Oxon.B.; Oxon.R.;  
R.A.S.i.; R.C.Surg.; R.S.; U.C.L.
- Gött. Nr.** ..... Nachrichten von der k. Gesellschaft der Wissenschaften und der  
Georg-Augusta-Universität zu Göttingen. Göttingen.  
1845— B.M.; Camb.P.S.; Camb.U.i.; Dub.R.D.S.i.; Dub.R.I.A.i.;  
Dub.T.C.i.; Edinb.R.S.; Glasg.U.i.; Linn.S.; Math.S.i.; N.H.M.;  
Oxon.B.; Oxon.R.; R.A.S.i.; R.C.Surg.i.; R.S.
- Gött. Stud. Vr.** ..... {Studien des Göttingischen Vereins Bergmännischer Freunde;  
**Gött. Vr. Stud.** ..... {Haussmann. Göttingen.  
1824—58. Geol.S.i.; R.S.; S.K.

## List of Serial Publications

- Gould As. J.**..... The *Astronomical Journal*; Gould. Cambridge, Mass.  
1851—81. B.M.; Camb.U.; Glasg.U.i.; Oxon.B.; Oxon.R.i.;  
R.A.S.; R.S.; S.K.  
*See As. J.*
- Gratz Mt. NW. Vr. Steierm.**..... Mittheilungen des Naturwissenschaftlichen Vereins für Steiermark.  
Gratz.  
1863— B.M.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.;  
Linn.S.i.; M.O.i.; N.H.M.; R.S.; U.C.L.i.  
*See Steierm. Mt.*
- Graub. W. Ga. Jbr.**..... Jahres-Bericht der Naturforschenden Gesellschaft Graubünden's.  
Chur.  
1854— B.M.i.; Camb.U.i.; Glasg.P.S.i.; N.H.M.; R.S.i.
- 's Gravenh. I. Ing. Ts.** ... Tijdschrift van het Koninklijk Instituut van Ingenieurs. 's Graven-  
hage.  
1870— [*Continuation of*: Verhandelingen, etc., 1848—69.] B.M.;  
I.CE.i.; P.O.
- 's Gravenh. I. Ing. Vh.** ... Verhandelingen van het Koninklijk Instituut van Ingenieurs.  
's Gravenhage.  
1848—69. [*Continued as*: Tijdschrift, etc. 1870—] B.M.; I.CE.i.;  
P.O.
- Graz I. Fl. Us.**..... Untersuchungen aus dem Institute für Physiologie und Histologie in  
Graz. Leipzig.  
1870—73. B.M.i.; Glasg.P.S.i.; N.H.M.i.; R.C.Surg.i.; R.S.i.
- Grenoble Ac. Delph. Ill.** Bulletin de l'Académie Delphinale, ou Société des Sciences et Arts  
de Grenoble. Grenoble.  
1846— B.M.; Camb.U.i.; Oxon.B.; R.S.i.
- Gruithuisen N. Analect.** Neue Analecten für Erd- und Himmelskunde. Gruithuisen.  
München.  
1832—36. B.M.; R.A.S.; R.S.
- Grunert Arch.** ..... Archiv der Mathematik und Physik; Grunert. Greifswald,  
Leipzig.  
1841— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Edinb.U.;  
Glasg.U.; Math.S.i.; Oxon.B.(R.); R.S.; U.C.L.i.  
*See Arch. Mth. Ts.*
- Grunert Met. Opt.** ..... Beiträge zur Meteorologischen Optik, etc.; Grunert. Leipzig.  
1848—50. B.M.; Camb.U.; Glasg.P.S.i.; M.O.; R.A.S.
- G. Teix. J. Sc.** ..... Jornal de Sciencias Mathematicas e Astronomicas, publicado pelo  
Dr Francisco Gomes Teixeira. Coimbra.  
1878— Math.S.; R.S.i.
- Guy's Hosp. Rp.** ..... Guy's Hospital Reports. London.  
1836— Camb.U.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; Oxon.B.(R.);  
R.C.Surg.; R.S.; U.C.L.i.
- Gz. C. It.** ..... Gazzetta Chimica Italiana. Palermo.  
1871— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.; Edinb.U.; P.O.;  
R.S.i.; S.K.
- Haarl. Ma. Teyl. Arch.**... Archives du Musée Teyler. Haarlem.  
1866— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.;  
Glasg.P.S.; N.H.M.; Oxon.R.; R.A.S.; R.S.; S.K.  
*See Haarl. Arch. Ma. Teyl.*
- Haarl. Ntk. Vh.** ..... { Natuurkundige Verhandelingen van de [Bataafsche] Hollandsche  
**Haarl. Ntk. Vh. Mtsch.**... { Maatschappij der Wetenschappen te Haarlem. Haarlem.  
**Haarl. Vh.**..... { 1799— B.M.; Camb.U.i.; Dub.R.D.S.; Geol.S.i.; Glasg.U.i.;  
N.H.M.; R.S.; S.K.i.
- Habana Ac. A.** ..... Anales de la Real Academia de Ciencias Medicas, Fisicas y Naturales  
de la Habana. Revista Científica. Habana.  
1864— N.H.M.
- Haidinger Ab.**..... Naturwissenschaftliche Abhandlungen; Haidinger. Wien.  
1847—51. Camb.U.; Chem.S.i.; Edinb.R.S.i.; Geol.S.; Linn.S.;  
N.H.M.; R.A.S.i.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.
- Haidinger B.** ..... Berichte über die Mittheilungen von Freunden der Naturwissen-  
schaften in Wien; Haidinger. Wien.  
1847—51. Camb.U.; Chem.S.i.; Edinb.R.S.; Geol.S.i.; Linn.S.;  
N.H.M.; R.A.S.; R.Geogr.S.; R.S.
- Hain. Mm. S.** ..... { Mémoires et Publications de la Société des Sciences, des Arts et des  
**Hain. S. Mm.** ..... { Lettres du Hainaut. Mons.  
1839— B.M.; Dub.T.C.i.; N.H.M.; Oxon.B.i.; R.S.i.; S.K.

## List of Serial Publications

- Hall Bij.** ..... Bijdragen tot de Natuurkundige Wetenschappen; Hall, etc. Amsterdam.  
1826—32. B.M.; Camb.U.; N.H.M.; R.S.; S.K.
- Halle Ab. Nf. Ga.** ..... Abhandlungen der Naturforschenden Gesellschaft zu Halle. Halle.  
1853— B.M.; Camb.U.; Edinb.R.S.i.; Glasg.P.S.i.; N.H.M.; Oxon.R.; R.C.Surg.i.; R.S.; S.K.  
*See Halle Nf. Ga. Ab.*
- Halle Jbr. Nf. Ga.** ..... Jahresbericht der Naturforschenden Gesellschaft zu Halle. Halle.  
1823—25. Glasg.P.S.i.; R.S.
- Halle Jbr. Nw. Vr.** ..... Jahresbericht des Naturwissenschaftlichen Vereins für Sachsen und Thüringen in Halle. Berlin.  
1848—52. [*Continued as:* Zeitschrift für die gesammten Naturwissenschaften, 1853—] Edinb.R.S.; Geol.S.i.; Glasg.P.S.i.; N.H.M.; Oxon.R.i.; R.S.; S.K.i.
- Halle Nf. Ga. Ab.** ..... *See Halle Ab. Nf. Ga.*
- Halle Nf. Ga. B.** ..... Bericht über die Sitzungen der Naturforschenden Gesellschaft zu Halle. Halle.  
1853—92. B.M.; Camb.U.i.; Edinb.R.S.i.; Glasg.P.S.i.; R.C.Surg.i.; R.S.i.  
*See Halle Sb. Nf. Ga.*
- Halle Nf. Ga. Festschr.** ..... Festschrift..... der Naturforschenden Gesellschaft zu Halle. Halle.  
1879. Glasg.P.S.i.; N.H.M.; Oxon.R.; R.S.; S.K.  
*See Halle Nf. Ga. B.*
- Halle Sb. Nf. Ga.** ..... *See Halle Nf. Ga. B.*
- Halle Z.** ..... Zeitschrift für die gesammten Naturwissenschaften; herausgegeben von dem Naturwissenschaftlichen Vereine für Sachsen und Thüringen in Halle; Giebel. Berlin.  
1853— [*Continuation of:* Jahresbericht des Naturwissenschaftlichen Vereins, 1848—52.] B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.S.; S.K.  
*See Z. Nw.*
- Halle Z. Nw.** ..... *See Z. Nw.*
- Hamb. Mth. Ga. Mt.** ..... Mitteilungen der Mathematischen Gesellschaft in Hamburg. Leipzig.  
1889— Math.S.
- Hamb. Nt. Vr. Ab.** ..... Abhandlungen aus dem Gebiete der Naturwissenschaften, herausg. vom Naturwissensch. Verein von Hamburg-Altona. Hamburg.  
1846— Camb.U.; Edinb.R.S.i.; Geol.S.t.; Linn.S.i.; N.H.M.; R.S.; S.K.
- Hamb. Nt. Vr. Vh.** ..... Verhandlungen des Naturwissenschaftlichen Vereins von Hamburg-Altona. Hamburg.  
1877—81; 1894— Dub.R.I.A.i.; Linn.S.i.; N.H.M.; R.S.
- Hamb. Wa. Anst. Jb.** ..... Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten. Hamburg.  
1884— Camb.U.; Edinb.R.S.; Linn.S.; N.H.M.; S.K.
- Hann. A.** ..... Hannöversche Annalen für die gesammte Heilkunde. Hannover.  
1836—46. B.M.; Glasg.P.S.i.; R.C.Surg.
- Hann. Archt.-Vr. Z.** ..... *See Hann. Z. Archt.-Vr.*
- Hann. Z. Archt.-Vr.** ..... Zeitschrift des Architekten- und Ingenieur-Vereins zu Hannover. Hannover.  
1855— Camb.U.i.; I.CE.; P.O.
- Harl. Arch. Ms. Teyl.** ... *See Harl. Ms. Teyl. Arch.*
- Harv. As. Obs. A.** ..... Annals of the Astronomical Observatory of Harvard College. Cambridge, Mass.  
1856— B.M.; Camb.P.S.; Camb.U.i.; Edinb.R.S.i.; Glasg.U.i.; M.O.i.; Oxon.B.; P.O.i.; R.A.S.; R.S.; S.K.i.; U.C.L.i.
- Hedw.** ..... Hedwigia: Notizblatt für kryptogamische Studien, nebst Repertorium für kryptog. Literatur. Dresden.  
1852— B.M.; Camb.U.i.; Dub.N.L.I.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.; N.H.M.
- Heidl. Nt. Md. Vh.** ..... Verhandlungen des Naturhistorisch-Medicinischen Vereins zu Heidelberg. Heidelberg.  
1857— Camb.U.i.; Chem.S.i.; Dub.R.I.A.; Geol.S.; Linn.S.i.; N.H.M.i.; R.S.i.
- Heid. Vh. Nt. Md.** ..... *See Heidel. Nt. Md. Vh.*
- Helsingf. Acta.** ..... Acta Societatis Scientiarum Fennicæ. Helsingfors.  
1842— B.M.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Glasg.U.i.; N.H.M.; Oxon.B.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.
- Helsingf. Öfv.** ..... Öfversigt af Finska Vetenskaps-Societetens Förhandlingar. Helsingfors.

## List of Serial Publications

- 1853— B.M.; Camb.P.S.i.; Camb.U.i.; Dub.R.D.S.; Dub.R.I.A.;  
Edinb.R.S.i.; Glasg.U.i.; M.O.i.; N.H.M.; Oxon.B.; R.A.S.;  
R.Geogr.S.i.; R.S.
- Henle u. Pfeufer Z.** ..... Zeitschrift für rationelle Medicin; Henle und Pfeufer. Zürich,  
Heidelberg, Leipzig.
- 1844—69. B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Oxon.R.;  
R.C.Surg.; R.S.; U.C.L.
- Hermbstädt ZIL** ..... Bulletin des Neuesten und Wissenswertesten aus der Naturwissen-  
schaft, etc.; Hermbstädt. Berlin.
- 1809—13. [Continued as: Museum des Neuesten, etc., 1814—18.]  
B.M.; Camb.U.; R.S.
- Hermbstädt Ma.** ..... Museum des Neuesten und Wissenswertesten aus dem Gebiete der  
Naturwissenschaft, der Künste, der Fabriken, der Manufakturen,  
der technischen Gewerbe, der Landwirtschaft, der Produk-  
tionen und Handelskunde, und der bürgerlichen Haushaltung,  
etc.; Hermbstädt. Berlin.
- 1814—18. [Continuation of: Bulletin des Neuesten, etc., 1809—13.]  
B.M.; Camb.U.; R.S.
- Hermst. Vh.** ..... Verhandlungen und Mittheilungen des Siebenbürgischen Vereins  
für Naturwissenschaften. Hermannstadt.
- 1850— B.M.; Camb.U.; Dub.R.I.A.i.; N.H.M.; R.S.; S.K.
- Herts. NH. S. T.** ..... Transactions of the Hertfordshire Natural History Society and Field  
Club. London, Watford, Hertford.
- 1880— [Continuation of: Transactions of the Watford Natural  
History Society and Hertfordshire Field Club, 1875—79.] B.M.;  
Camb.U.; Dub.R.I.A.i.; Geol.M.; Geol.S.; Glasg.P.S.; Linn.S.;  
N.H.M.; Oxon.B.; R.S.; U.C.L.
- Hisinger Afh.** ..... Afhandlingar i Fysik, Kemi, och Mineralogie; Hisinger och  
**Hisinger Afh. Fys.** ..... Berzelius. Stockholm.
- 1806—18. Glasg.P.S.i.; Glasg.U.i.; N.H.M.; R.C.Surg.; R.S.; S.K.
- Hoeven en Vriese Ts.** ..... Tijdschrift voor Natuurlijke Geschiedenis en Physiologie; Hoeven  
en Vriese. Amsterdam.
- 1834—45. B.M.; Camb.U.; N.H.M.
- Holländ. Mg.** ..... Holländisches Magazin der Naturkunde. Frankfurt-am-Main.
- 1802—05. Glasg.P.S.i.; R.S.
- Hufeland J. Arzn.** ..... Journal der practischen Arzneykunde [und Wundarzneykunst];  
Hufeland, etc. Jena.
- 1795—1844. B.M.; Glasg.P.S.i.; R.C.Surg.
- Humb.** ..... Humboldt. Monatschrift für die gesammten Naturwissenschaften.  
Stuttgart.
- 1882—90. B.M.; Glasg.P.S.i.; P.O.; S.K.
- I. CE. P.** ..... Minutes of Proceedings of the Institution of Civil Engineers, con-  
taining Abstracts of the Papers and of the Discussions. London.
- 1837— B.M.; Camb.P.S.; Camb.U.; Dub.R.C.S.; Dub.R.D.S.;  
Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.i.;  
Glasg.U.; I.CE.; Oxon.B.; Oxon.R.i.; P.O.; R.Geogr.S.; R.S.;  
S.K.; U.C.L.
- See **CE. I. F.**
- I. Egypt. ZIL** ..... Bulletin de l'Institut Egyptien. Le Caire.
- 1859— Camb.P.S.i.; Camb.U.i.; N.H.M.; R.Geogr.S.i.; U.C.L.i.
- Ikat. S. Our. ZIL** ..... Bulletin de la Société Ouralienne d'Amateurs des Sciences Naturelles.  
Ekaterinburg.
- 1874— Edinb.R.S.i.; Geol.S.i.; N.H.M.i.
- I. Elect. E. J.** ..... Journal of the Institution of Electrical Engineers, late the Society  
of Telegraph Engineers and Electricians. London.
- 1890— [Continuation of: Journal of the Society of Telegraph  
Engineers and Electricians, 1872—89.] B.M.; Camb.P.S.i.;  
Camb.U.; Dub.T.C.i.; Edinb.R.S.i.; Glasg.U.i.; I.CE.; Oxon.B.;  
Oxon.R.; P.O.; R.S.; S.K.; U.C.L.
- I. Gl. Sv. Mem.** ..... Memoirs of the Geological Survey of India. Calcutta.
- 1859— B.M.; Camb.P.S.; Camb.U.i.; Dub.N.L.I.; Dub.R.C.S.;  
Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.U.;  
I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.C.Surg.;  
R.Geogr.S.; R.S.; U.C.L.i.
- Il Cim.** ..... Il Cimento, Rivista di Scienze, Lettere, ed Arti. Torino.
- 1852—55. B.M.

## List of Serial Publications

- Il Folio** ..... Il Politecnico; Repertorio mensile di Studj applicati alla Prosperità e Coltura sociale. 1839—44; 1860—65. Il Politecnico; Repertorio di Studj letterarj, scientifici e tecnici. Milano. 1866— B.M.i.; I.CE.i.; P.O.
- Il Progresso** ..... Il Progresso delle Scienze, Lettere, ed Arti. Napoli. First series undated; Second series 1832—64. Camb.U.; Oxon.B.
- Il Tempo** ..... Il Tempo, Giornale Italiano di Medicina, etc. Firenze. 1858—60. B.M.; Glasg.P.S.i.
- I. MECH. P.** ..... Institution of Mechanical Engineers. Proceedings. Birmingham, London. 1847— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.D.S.i.; Glasg.P.S.; Glasg.U.; I.CE.; Oxon.R.i.; P.O.; R.S.; S.K.i.; U.C.L.  
*See MECH. I. P.*
- I. MIN. E. T.** ..... Transactions of the Institution of Mining Engineers. Newcastle-upon-Tyne. 1898— [*Continuation of: Transactions of the Federated Institution of Mining Engineers, 1889—98.*] Camb.U.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.; Oxon.B.; P.O.; S.K.
- Ing.** ..... Der Ingenieur; Zeitschrift für das gesammte Ingenieurwesen; Bornemann. Freiberg. 1848—50. B.M.; I.CE.; P.O.
- Inghirami Opusca** ..... Nuova Collezione di Opuscoli e Notizie di Scienze; Inghirami. Fiesole. 1820—23. B.M.
- Innsb. Ferd. E.** ..... Zeitschrift des Ferdinandeums für Tirol und Vorarlberg. Innsbruck. 1852— B.M.; N.H.M.; R.S.
- Innsb. Nt. Med. B.** ..... Berichte des Naturwissenschaftlich-Medizinischen Vereins in Innsbruck. Innsbruck. 1870— B.M.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Linn.S.i.; N.H.M.; Oxon.R.; R.S.
- Intell. Obs.** ..... The Intellectual Observer; a Review of Natural History, Microscopic Research, and Recreative Science. London. 1862—68. [*Continuation of: Recreative Science, 1859—62.*] [*Continued as: The Student and Intellectual Observer, 1868—71.*] B.M.; Camb.U.; Geol.S.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.; R.S.i.; S.K.
- Int. Md. Cg. T.** ..... { Comptes-Rendus [Atti, Verhandlungen, Transactions] du Congrès  
**Int. Md. Cg. Vh.** ..... { International de Médecine. Paris, etc.  
1867— B.M.; Camb.U.i.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.  
*See Cg. Int. Md. C. R. and Cg. Md. Int. At.*
- Iowa Ac. Sc. P.** ..... Proceedings of the Iowa Academy of Sciences. Des Moines. 1875— B.M.i.; Edinb.R.S.i.; N.H.M.; Oxon.B.i.; P.O.; R.S.i.; U.C.L.i.
- Ir. Ac. F.** ..... Proceedings of the Royal Irish Academy. (Science.) Dublin. 1836— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Dub.R.C.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.; Linn.S.; Math.S.i.; M.O.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.i.; R.A.S.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
- Ir. Ac. T.** ..... Transactions of the Royal Irish Academy. Science. Dublin. 1787— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.; I.CE.; Linn.S.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.i.; R.A.S.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.
- Ir. Gl. S. J.** ..... Journal of the Royal Geological Society of Ireland. London, Dublin, Edinburgh. 1864—87. [*Continuation of: Journal of the Geological Society of Dublin, 1833—64.*] B.M.; Camb.U.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.M.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; R.C.Surg.; R.Geogr.S.i.; R.S.
- Ir. Natlist** ..... The Irish Naturalist: A Monthly Journal of General Irish Natural History. Dublin, Belfast, London. 1892— B.M.; Camb.P.S.i.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Dub.T.C.; Geol.M.i.; Geol.S.; Linn.S.; N.H.M.; S.K.

## List of Serial Publications

- Isère S. St.** ..... Bulletin de la Société de Statistique, des Sciences Naturelles, et des Arts Industriels du département de l'Isère. Grenoble.  
1838— B.M.i.; N.H.M.; Oxon.B.; R.S.i.
- I. & S. I. J.** ..... The Journal of the Iron and Steel Institute. London.  
1872— Camb.U.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.;  
Edinb.U.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.;  
I.CE.; Oxon.B.; P.O.; R.S.; S.K.; U.C.L.
- I. Solvay Tr.** ..... Institut Solvay. Travaux de Laboratoire. Bruxelles.  
1896— Glasg.P.S.i.; R.S.
- It. S. Ge. St.** ..... Bollettino della Società Geologica Italiana. Rome.  
1862— B.M.; Geol.M.; Geol.S.; Glasg.P.S.i.; N.H.M.; Oxon.R.
- It. S. Met. An.** ..... Annuario Meteorologico Italiano pubblicato per cura del Comitato direttivo della Società Meteorologica Italiana. Torino, Roma, Firenze.  
1886—92 B.M.; M.O.
- Jam. I. J.** ..... Journal of the Institute of Jamaica. Kingston, Jamaica.  
1891— B.M.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; N.H.M.;  
R.Geogr.S.i.; R.S.; S.K.
- J. Anal. C.** ..... The Journal of Analytical [and Applied] Chemistry. Easton, Pa.  
1887—93. Chem.S.; P.O.i.
- J. An. Pl.** ..... The Journal of Anatomy and Physiology, normal and pathological.  
London, Cambridge, Edinburgh.  
1867— B.M.; Camb.P.S.; Camb.U.; Edinb.R.S.; Edinb.U.;  
Glasg.P.S.; Glasg.U.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.;  
R.C.Surg.; R.S.; S.K.; U.C.L.
- Jap. As. S. T.** ..... Transactions of the Asiatic Society of Japan. Yokohama.  
1872— B.M.; Camb.U.; Edinb.R.S.; N.H.M.; Oxon.B.; Oxon.R.;  
P.O.i.; R.Geogr.S.i.; R.S.
- Jap. Seism. S. T.** ..... Transactions of the Seismological Society of Japan. Yokohama.  
1890—92. [*Continued as: Seismological Journal of Japan, 1893—95.*]  
Camb.U.; Dub.R.I.A.; Edinb.R.S.; Geol.M.; Glasg.U.i.; I.CE.i.;  
N.H.M.i.; R.A.S.i.; R.Geogr.S.; R.S.i.; U.C.L.i.
- Jb. Berg.-Hm.** ..... Berg- und Hüttenmännisches Jahrbuch der k.k. Schemnitzer-Bergakademie und der k.k. Montan-Lehranstalten zu Leoben und Pörschach. Wien.  
1851— B.M.i.; Geol.S.i.; I.CE.i.; P.O.i.; S.K.  
*See Berg.-Hm. Jb., Leoben Berg.-Hm. Jb., and Wien Berg.-Hm. Jb.*
- Jb. Berg.-Hw.** ..... Jahrbuch für das Berg- und Hüttenwesen im Königreiche Sachsen. Freiberg.  
1873— [*Continuation of: Jahrbuch für den Berg- und Hüttenmann, 1837—72.*] B.M.; Geol.S.; I.CE.; N.H.M.i.; P.O.; S.K.
- Jb. Mijnw. Ned. Ind.** ..... Jaarboek van het Mijnewezen in Nederlandsch Oost-Indië. Amsterdam.  
1872— B.M.; Geol.S.; Glasg.P.S.i.; I.CE.; N.H.M.; P.O.; S.K.i.
- J. Bot.** ..... The Journal of Botany, British and Foreign. London.  
1863— B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.C.S.; Glasg.U.;  
Linn.S.; N.H.M.; Oxon.B.; Pharm.S.; P.O.i.; R.C.Surg.i.;  
R.S.i.; S.K.i.
- J. C. Méd.** ..... Journal de Chimie Médicale, de Pharmacie, et de Toxicologie. Paris.  
1825—76. B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.;  
Oxon.B.(R.); Pharm.S.i.; R.C.Surg.i.; R.S.i.
- J. de Ph.** ..... Journal de Physique, de Chimie, et d'Histoire Naturelle; de Lamétherie, etc. Paris.  
1794—1823. B.M.; Camb.U.; Geol.S.; Glasg.U.i.; N.H.M.i.;  
Oxon.B.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- J. de Ph.** ..... Journal de Physique Théorique et Appliquée; d'Almeida. Paris.  
1872— Camb.P.S.i.; Camb.U.; Dub.R.C.S.; Glasg.U.i.; I.CE.i.;  
Oxon.R.; P.O.; R.S.; S.K.
- Jena. Sh.** ..... Sitzungsberichte der Jenaischen Gesellschaft für Medicin und Naturwissenschaft. Jena.  
1877—86. Edinb.R.S.i.; Linn.S.i.; Oxon.R.; R.S.; S.K.
- Jena. Z.** ..... Jenaische Zeitschrift für Naturwissenschaft, herausg. von der Medicinisch-Naturwissenschaftlichen Gesellschaft zu Jena. Jena.  
1864— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.N.L.I.i.;



## List of Serial Publications

- Dub.R.D.S.i.; Edinb.R.S.; Edinb.U.i.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Jern-Kont. A.** ..... Jern-Kontoret's Annaler. En Tidskrift för Svenska Bergshand-  
teringen. Stockholm.  
1817— B.M.; I.CE.i.; P.O.; R.S.i.; S.K.
- J. Gén. Civ.** ..... Journal du Génie Civil des Sciences et des Arts. Paris.  
1828—48. B.M.i.; Camb.U.; P.O.
- J. H. Un. Cir.** ..... The Johns Hopkins University Circulars. Baltimore.  
1879— Camb.P.S.; Camb.U.; Dub.N.L.I.i.; Dub.R.I.A.i.;  
Edinb.R.S.i.; Edinb.U.; Glasg.P.S.; Glasg.U.i.; Math.S.i.;  
N.H.M.; Oxon.B.; Oxon.R.; R.A.S.i.; R.Geogr.S.i.; R.S.;  
S.K.; U.C.L.i.
- J. I. Archip.** ..... Journal of the Indian Archipelago and Eastern Asia. Singapore.  
1847—58. B.M.i.; Camb.U.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.i.;  
N.H.M.; P.O.; R.Geogr.S.; R.S.; S.K.i.
- J. Landw.** ..... Journal für Landwirtschaft. Celle, Göttingen, Berlin.  
1853— B.M.i.; P.O.i.
- J. Microgr.** ..... Journal de Micrographie. Paris.  
1877—92. Camb.U.; Glasg.P.S.i.; N.H.M.; Oxon.R.; P.O.i.
- J. Micr. Sc.** ..... Quarterly Journal of Microscopical Science; Lankester and Busk.  
London.  
1853— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.;  
Dub.R.C.S.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.;  
Glasg.U.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.;  
P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.
- See Micr. J. and QJ. Micr. Sc.*
- J. Méd. Chir. Phm.** ..... Journal de Médecine, Chirurgie, Pharmacie, etc. Paris.  
1801—17. [Continued as: Nouveau Journal de Médecine, etc.  
1818—22.] Edinb.U.i.; R.C.Surg.; R.S.
- J. Mines** ..... Journal des Mines, ou Recueil de Mémoires sur l'exploitation des  
Mines, et sur les Sciences et les Arts qui s'y rapportent. Paris.  
1794—1815. [Continued as: Annales des Mines, 1817—] B.M.;  
Camb.U.; Dub.T.C.; Edinb.R.S.; Geol.S.; I.CE.; Linn.S.i.;  
N.H.M.; Oxon.B.(R.); R.S.i.; S.K.
- J. Phm.** ..... Journal de Pharmacie et des Sciences accessoires. Paris.  
1815—41. [Continuation of: Bulletin de Pharmacie, 1809—14.]  
[Continued as: Journal de Pharmacie et de Chimie, 1842—]  
Camb.U.; Chem.S.; Edinb.R.S.i.; Edinb.U.; Glasg.U.; Oxon.B.;  
Pharm.S.; P.O.; R.C.Surg.; R.S.i.; U.C.L.i.
- J. Pl. Pth. Gén.** ..... Journal de Physiologie et de Pathologie Générale. Paris.  
1899— [Continuation of: Archives de Physiologie, etc., 1868—  
98.] B.M.; Edinb.U.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.; R.S.;  
U.C.L.
- J. Pr. C.** ..... Journal für praktische Chemie; Erdman, etc. Leipzig.  
1834— [Continuation of: Journal für technische und ökonomische  
Chemie, 1828—33.] B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.;  
Dub.R.C.S.i.; Dub.R.D.S.i.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.;  
N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.;  
S.K.; U.C.L.i.
- See Erdm. J. Pr. C.*
- J. Pa. C.** ..... The Journal of Physical Chemistry. Ithaca, N.Y.  
1896— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Edinb.R.S.;  
Edinb.U.; Glasg.U.; Oxon.R.; P.O.; R.S.i.; S.K.
- J. Sav.** ..... Journal des Savants. Paris.  
1816— B.M.; Camb.U.; Dub.N.L.I.; Dub.T.C.; Edinb.R.S.i.;  
Glasg.U.; Oxon.B.; Oxon.R.; P.O.i.; R.S.
- J. Sc.** ..... The Journal of Science and Annals of Astronomy, Biology, Geology,  
Industrial Arts, Manufactures and Technology. London.  
1879—85. [Continuation of: The Quarterly Journal of Science,  
1864—78.] B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Edinb.R.S.;  
Edinb.U.i.; Glasg.U.i.; I.CE.; Linn.S.i.; N.H.M.; Oxon.R.;  
Pharm.S.i.; P.O.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.
- J. Tél.** ..... Journal Télégraphique publié par le Bureau International des  
Administrations Télégraphiques. Berne.  
1869— P.O.
- Kan. Ac. Sc. T.** ..... Transactions of the Kansas Academy of Science. Topeka, Kansas.

## List of Serial Publications

- 1872— Camb.P.S.i.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.i.;  
Glasg.P.S.i.; Linn.S.i.; N.H.M.; Oxon.B.i.; R.S.i.; U.C.L.i.
- Kan. Un. Q.** ..... The Kansas University Quarterly. Lawrence, Kansas.
- 1893— B.M.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.  
S.i.; Glasg.P.S.i.; Math.S.i.; N.H.M.; R.S.
- Karlsruhe Mt. Vr. Vh.** ... Verhandlungen des Naturwissenschaftlichen Vereins in Karlsruhe.  
Karlsruhe.
- 1864— B.M.i.; Dub.R.I.A.; Geol.S.i.; N.H.M.
- See Karlsruhe Vh. Nw. Vr.*
- Kärnten Landma. Jb.** ... Jahrbuch des Naturhistorischen Landesmuseums von Kärnten.  
Klagenfurt.
- 1852— Camb.U.; Geol.S.i.; Glasg.P.S.i.; N.H.M.; R.S.i.
- Karsten Arch.**..... Archiv für Mineralogie, Geognosie, Bergbau, und Hüttenkunde;  
Karsten. Berlin.
- 1829—55. B.M.; Edinb.R.S.i.; Geol.M.; Geol.S.; N.H.M.; P.O.;  
R.S.
- Karsten Arch. Bergbau**... Archiv für Bergbau und Hüttenwesen; Karsten. Berlin, Breslau.
- 1818—31. N.H.M.; P.O.; R.S.; S.K.
- Kassel Vr. Mt. Ab. u. B.** Abhandlungen u. Bericht...des Vereins für Naturkunde zu Kassel.  
Kassel.
- 1894—98. [*Continuation of*: Bericht, etc., 1837—94.] Edinb.R.S.i.;  
Glasg.P.S.i.; N.H.M.
- Kassel Vr. Mt. B.** ..... Bericht des Vereines für Naturkunde zu Kassel. Kassel.
- 1837—94. [*Continued as*: Abhandlungen u. Bericht, etc. 1894—98.]  
Edinb.R.S.i.; Glasg.P.S.i.; N.H.M.; R.S.i.
- Kassel Vr. Mt. Festschr.** ... Festschrift des Vereins für Naturkunde zu Cassel zur Feier seines  
fünfzigjährigen Bestehens. Cassel.
1886. N.H.M.
- Kastner Arch. C.** ..... Archiv für Chemie und Meteorologie; Kastner. Nürnberg.
- 1830—35. Edinb.R.S.; M.O.i.; N.H.M.; P.O.; R.S.
- Kastner Arch. Mt.** ..... Archiv für die gesammte Naturlehre; Kastner. Nürnberg.
- 1824—35. B.M.; N.H.M.; P.O.; R.C.Surg.i.; S.K.
- Kazan Mem. Un.** ..... Scientific Memoirs published by the Imperial University of Kazan.  
[In Russian.] Kazan.
- 1834— B.M.i.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.i.;  
Glasg.P.S.i.; Linn.S.i.; R.S.i.
- See Kazan Un. Mem.*
- Kazan S. Mt. (Ps.-Mth.) P.** Proceedings of the Physico-Mathematical Section of the Naturalists'  
Society of the Imperial University of Kazan. [In Russian.] Kazan.
- 1883—90. [*Continued as*: Bulletin de la Société Physico-Mathé-  
matique de Kazan, 1891—] R.S.
- Kazan S. Mt. T.** ..... Transactions of the Naturalists' Society of the Imperial University  
of Kazan. [In Russian.] Kazan.
- 1871— B.M.; Glasg.P.S.i.; N.H.M.
- Kazan S. Pa.-Mth. Bil.** ... Bulletin de la Société Physico-Mathématique de Kazan. [In Russian.]  
Kazan.
- 1891— [*Continuation of*: Proceedings of the Physico-Mathematical  
Section of the Naturalists' Society of the Imperial University of  
Kazan, 1883—90.] Dub.R.I.A.i.; Edinb.R.S.i.; R.S.i.
- Kazan Un. Mem.** ..... *See Kazan Mem. Un.*
- Kharkov Mth. S. Com.**... Communications and Proceedings of the Mathematical Society of  
the Imperial University of Kharkov. [In Russian.] Kharkov.
- 1879— R.S.i.
- Kiel Schr.**..... Schriften der Universität zu Kiel. Kiel.
- 1855—80. B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; N.H.M.i.;  
Oxon.B.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.i.
- Kiev S. Mt. Mem.** ..... Memoirs of the Kiev Naturalists' Society. [In Russian.] Kiev.
- 1870— B.M.; Camb.P.S.i.; Dub.R.I.A.i.; Glasg.P.S.i.; N.H.M.;  
R.Geogr.S.i.; R.S.i.
- Kjøb. St. F. Medd.** ..... Meddelelser fra den Botaniske Forening i Kjøbenhavn. Kjøbenhavn.  
1882—91. Linn.S.
- Kjøb. Carlsb. Lb. Medd.**... Meddelelser fra Carlsberg Laboratoriet. Kjøbenhavn.
- 1876— B.M.; Chem.S.; Glasg.P.S.i.; N.H.M.; P.O.; R.S.
- Kjøb. Dn. Vd. Selsk. Afh.** { Det Kongelige Danske Videnskabernes Selskabs naturvidenskabelige  
og matematiske Afsandlinger. Kiøbenhavn.
- Kjøb. Dn. Vd. Selsk. Afh.** { 1824—46. B.M.; Dub.T.C.; Edinb.R.S.; Geol.S.i.; Linn.S.i.;  
N.H.M.; R.S.; S.K.

## List of Serial Publications

- Kjöb. Dn. Vd. Selsk. Skr.** { Det Kongelige Danske Videnskabernes Selskabs Skrifter. Kiöbenhavn. 1801—18. B.M.; Camb.P.S.i.; Camb.U.; Edinb.R.S.; N.H.M.; Oxon.B.; R.S.  
**Kjöb. Dn. Vd. Selsk. Skr.** { *See Dn. Vd. Selsk. Skr.*
- Kjöb. Dn. Vd. Selsk. Skr.** { Det Kongelige Danske Videnskabernes Selskabs Skrifter. Natur-  
**Kjöb. Skr.** { videnskabelig og Mathematisk Afdeling. Kiöbenhavn.  
**Kjöb. Skr.** { 1849— B.M.; Camb.U.i.; Edinb.R.S.; Linn.S.; N.H.M.; R.A.S.; R.Geogr.S.; R.S.; U.C.L.i.
- Kjöb. Ov.** { Oversigt over det Kongelige Danske Videnskabernes Selskabs For-  
**Kjöb. Ov.** { handlinger. Kiöbenhavn.  
**Kjöb. Ov.** { 1806— Camb.P.S.; Camb.U.i.; Chem.S.i.; Dub.R.D.S.i.; Dub. R.I.A.i.; Dub.T.C.i.; Edinb.R.S.i.; Geol.S.i.; Glasg.U.i.; Linn. S.i.; M.O.i.; N.H.M.i.; Oxon.R.; P.O.i.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- Kolozsvár Orv.-Term. Társ. Éta.** { Értésítő a "Kolozsvári Orvos-Természettudományi Társulat" -nak az...orvosi, természettudományi szaküléseiről... [Proceedings of the medical and natural history sections of the Klausenburg Medical and Natural History Society.] Kolozsvár [Klausenburg]. 1876—79. N.H.M.
- Königsb. Nw. Unterh.** { Königsberger Naturwissenschaftliche Unterhaltungen. Königsberg. 1842—46. Camb.U.; Glasg.P.S.i.; R.S.
- Königsb. SB.** { Schriften der königlichen Physikalisch-Oekonomischen Gesellschaft zu Königsberg. Königsberg.  
**Königsb. Schr.** { 1860— B.M.; Camb.P.S.; Dub.R.I.A.; Edinb.R.S.i.; Linn.S.; N.H.M.; P.O.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.
- Kosmos (Lw.)** { Kosmos. Czasopismo polskiego Towarzystwa przyrodników imienia Kopernika. [Cosmos. The Journal of the Polish Society of Naturalists founded in honour of Copernicus.] Lwow. 1876— B.M.; N.H.M.
- Krk. Ak. (Mt.-Prz.) Pam.** { Pamiętnik Akademii Umiejętności w Krakowie. Wydział Matematyczno-Przyrodniczy. [Memoirs of the Academy of Science in Cracow. Section of Mathematics and Natural Science.] Kraków. 1874— B.M.; Edinb.R.S.i.; Glasg.U.i.; N.H.M.
- Krk. Ak. (Mt.-Prz.) Rz.** { Rozprawy... Wydziału Matematyczno-Przyrodniczego Akademii Umiejętności. [Proceedings of the Section of Mathematics and Natural Science of the Academy of Science.] Kraków.  
**Krk. Ak. (Mt.-Prz.) Rz. & Sp.** { 1874— B.M.; Camb.U.i.; Edinb.R.S.i.; Geol.S.i.; Glasg.U.i.; N.H.M.
- Krk. Roczn. Tow. Nauk.** { Rocznik Towarzystwa Naukowego z Uniwersytetem Krakowskim Połączonego. Krakowie. [Annals of the Scientific Society of the Polish University of Krakow. Krakow.]  
**Krk. Roczn. Uniwera.** { 1817—72. B.M.; Glasg.U.i.
- Lamont A. Met.** { Annalen für Meteorologie, Erdmagnetismus, und verwandte Gegenstände; Lamont. München. 1842—44. Camb.U.; Glasg.P.S.i.; M.O.; R.S.; S.K.
- Lamont Jb. Sternw. Münch.** { Jahrbuch der K. Sternwarte bei München; Lamont. München. 1838—41. B.M.; Camb.U.; R.A.S.; R.S.
- Lanc. Hist. S. T.** { Proceedings and Papers of the Lancashire and Cheshire Historic Society. Liverpool.  
**Lanc. T. Hist. S.** { 1849—54. [Continued as: Transactions, etc., 1855—] B.M.; Camb.U.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; Oxon.B.i.; R.Geogr.S.i.; R.S.
- Laus. Bil. S. Vd.** { Bulletin des Séances de la Société Vaudoise des Sciences Naturelles. Lausanne. 1842— Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.; Linn.S.; N.H.M.; Oxon.B.i.; R.C.Surg.i.; R.S.; S.K.i.  
*See Laus. S. Vd. Bil.*
- Laus. C. R. S. Suisse.** { Comptes Rendus de la Société Suisse. Lausanne. 1861. Glasg.P.S.i.; N.H.M.; R.S.
- Lausitz. Mtschr.** { Lausitzische [und neue Lausitzische] Monatsschrift. Organ der Oberlausitzischen Gesellschaft der Wissenschaften. Görlitz. 1800—08. B.M.
- Laus. S. Vd. Bil.** { *See Laus. Bil. S. Vd.*
- Lb.** { The Laboratory, a Weekly Record of Scientific Research. London. 1867. B.M.; Chem.S.; Oxon.R.; Pharm.S.; P.O.; R.S.

## List of Serial Publications

- Leic. S. T.**..... The Transactions of the Leicester Literary and Philosophical Society. Leicester.  
1835— Camb.U.; Dub.R.D.S.; Geol.S.; Glasg.P.S.; Linn.S.i.; M.O.i.; N.H.M.i.; Oxon.B.; P.O.; S.K.; U.C.L.
- Leijd. A. Ac.**..... Annales Academiæ Lugduno-Batavæ. Leijden.  
1815—75. B.M.; Camb.U.; Dub.T.C.i.; N.H.M.; Oxon.B.; R.C.Surg.i.; R.S.i.; U.C.L.i.
- Leip. Ab. Jablon. Gs.**..... Abhandlungen bei Begründung der k. Sächsischen Gesellschaft der Wissenschaften am Tage der zweihundertjährigen Geburtsfeier Leibnizens; herausg. v. d. Jablonowski'schen Gesellschaft zu Leipzig. Leipzig.  
1846. Camb.U.; Dub.R.I.A.; Edinb.R.S.; N.H.M.; R.A.S.; R.S.; S.K.
- Leip. Ab. Mth. Pa.**..... Abhandlungen der Mathematisch-Physischen Classe der Königlich Sächsischen Gesellschaft der Wissenschaften. Leipzig.  
1852— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Glasg.U.; Math.S.i.; N.H.M.; Oxon.B.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.i.  
*See Leip. Mth. Pa. Ab.*
- Leip. Arb. Fl. Anst.**..... Arbeiten aus der Physiologischen Anstalt zu Leipzig. Leipzig.  
1866—76. Camb.U.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.; R.S.
- Leip. As. Gs. Vjschr.**..... Vierteljahrschrift der Astronomischen Gesellschaft. Leipzig.  
1866— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Oxon.R.; R.A.S.; R.S.; S.K.
- Leip. B.**..... Berichte über die Verhandlungen (Math.-Phys. Classe) der Königlich Sächsischen Gesellschaft der Wissenschaften zu Leipzig. Leipzig.  
1846— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Glasg.U.; Math.S.i.; N.H.M.; Oxon.B.; Oxon.R.; R.A.S.; R.S.; S.K.i.; U.C.L.i.  
*See Leip. Mth. Pa. B.*
- Leip. Jablon. Preisschr.**..... Preisschriften gekrönt und herausgegeben von der Fürstlich Jablonowski'schen Gesellschaft zu Leipzig. Leipzig.  
1847— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; N.H.M.; Oxon.B.; R.A.S.i.; R.S.i.; U.C.L.i.
- Leip. Mth. Pa. Ab.**..... *See Leip. Ab. Mth. Pa.*
- Leip. Mth. Pa. B.**..... *See Leip. B.*
- Leip. NL Gs. Sb.**..... Sitzungsberichte der Naturforschenden Gesellschaft zu Leipzig. Leipzig.  
1875— B.M.; Camb.U.; Edinb.R.S.i.; N.H.M.; R.C.Surg.; R.S.i.; S.K.
- L. Electr. S. F.**..... Proceedings of the London Electrical Society. London.  
1841—43. [*Continuation of:* Transactions and Proceedings, 1837—40.] B.M.; Camb.U.; Chem.S.; Geol.S.; Glasg.P.S.i.; I.CE.; Oxon.B.; P.O.; R.S.; S.K.
- Leoben Berg- Hm. Jb.**... Berg- und Hüttenmännisches Jahrbuch der k.k. Schemnitzer-Bergakademie und der k. k. Montan-Lehranstalten zu Leoben und Pöfgram. Wien.  
1851— B.M.i.; Geol.S.i.; I.CE.i.; P.O.i.; S.K.  
*See Berg- Hm. Jb., Jb. Berg- Hm., and Wien Berg- Hm. Jb.*
- Leonhard u. Bronn N. Jb.**... Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefaktenkunde; Leonhard und Bronn. Stuttgart.  
1833—62. [*Continuation of:* Jahrbuch für Mineralogie, etc., 1830—32.] [*Continued as:* Neues Jahrbuch für Mineralogie, Geologie und Paläontologie, 1863—] B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.D.S.i.; Geol.M.; Geol.S.; Glasg.U.; I.CE.i.; N.H.M.; Oxon.R.; R.S.; S.K.i.
- Le Puy A. S. Ag.**..... {Annales de la Société d'Agriculture, Sciences, etc., du Puy. Le Puy.  
**Le Puy S. Ag. A.**..... {1826— Geol.S.i.; N.H.M.
- Les Mondes**..... Les Mondes, Revue hebdomadaire des Sciences et de leurs Applications aux Arts et à l'Industrie; l'Abbé F. Moigno. Paris.  
1863—84. B.M.; Camb.U.i.; Dub.N.L.I.i.; Glasg.P.S.i.; I.CE.i.; M.O.i.; Oxon.R.; P.O.; R.S.i.; S.K.i.
- L'I**..... L'Institut; Journal des Académies et Sociétés Scientifiques de la France et de l'Étranger. Paris.  
1833—76. B.M.i.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Geol.S.i.;

## List of Serial Publications

- Glasg.P.S.i.; N.H.M.i.; Oxon.B.(R.); P.O.i.; R.C.Surg.i.; R.S.i.; S.K.i.
- Lick Obs. Ct.** ..... Contributions from the Lick Observatory. Sacramento. 1889—95. B.M.i.; Edinb.R.S.; R.A.S.
- Lieb. A.** ..... Annalen der Chemie und Pharmacie; Liebig, etc. Lemgo, Leipzig, Heidelberg. 1832— B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Dub.R.C.S.i.; Edinb.R.S.i.; Edinb.U.; Glasg.P.S.; Glasg.U.i.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.  
*See A. C. Phm.*
- Liège A. Ac.** ..... Annales Academiæ Leodiensis. Liège. 1817—27. B.M.; Camb.U.; Dub.T.C.; N.H.M.; Oxon.B.; R.S.
- Liège Lb. Fred. Tr.** ..... Université de Liège. Institut de Physiologie. Travaux du Laboratoire de Léon Fredericq. Paris, Liège. 1886— Edinb.R.i.; Glasg.P.S.i.; R.S.
- Liège Mm. S. Sc.** ..... Mémoires de la Société [Royale] des Sciences, de l'Agriculture, et des Arts à Liège. Liège. 1843— B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.i.; N.H.M.; Oxon.B.; P.O.; R.S.; S.K.  
*See Liège S. Sc. Mm.*
- Liège S. G. Belg. A.** ..... Annales de la Société Géologique de Belgique. Liège. 1874— Camb.P.S.; Geol.M.; Geol.S.; I.CE.i.; N.H.M.; R.S.; S.K.i.
- Liège S. Sc. Mm.** ..... *See Liège Mm. S. Sc.*
- Lille Mm.** ..... Mémoires de la Société [Royale] des Sciences, etc. à Lille. Lille. 1827—96. B.M.; Camb.U.; Dub.T.C.; N.H.M.; Oxon.B.; Oxon.R.; R.S.i.  
*See Lille S. Mm.*
- Lille S4. Pbl.** ..... Séances Publiques de la Société des Amateurs. Lille. 1806—19. [Continued as: Recueil des Travaux, etc., 1819—27.] B.M.; Glasg.P.S.i.; N.H.M.; Oxon.R.  
*See Lille Mm.*
- Lille S. Mm.** ..... *See Lille Mm.*
- Lille Tr.** ..... Recueil des Travaux de la Société d'Amateurs des Sciences, de l'Agriculture, et des Arts à Lille. Lille. 1819—27. [Continuation of: Séances Publiques, etc., 1806—19.] B.M.; Camb.U.; Dub.T.C.; N.H.M.; Oxon.B.; Oxon.R.; R.S.
- Lille Tr. Mm.** ..... Travaux et Mémoires de l'Université de Lille. Lille. 1889— Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; N.H.M.; R.S.; S.K.i.
- Lindenau Z.** ..... Zeitschrift für Astronomie und verwandte Wissenschaften; Lindenau. Tübingen. 1816—18. B.M.; Camb.U.; R.A.S.; R.S.
- Linnæa** ..... Linnæa; ein Journal für die Botanik in ihrem ganzen Umfange. Berlin. 1826—82. B.M.; Camb.U.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.; N.H.M.; R.S.
- Liouv. J.** ..... Journal de Mathématiques pures et appliquées, fondé par Joseph Liouville. Paris. 1836— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; I.CE.i.; Oxon.B.(R.); R.S.; S.K.; U.C.L.
- Liouv. J. Mth.** ..... *See Liouv. J.*
- Lisb. Ac. Sc. Mm.** ..... Historia e Memorias da Academia Real das Sciencias de Lisboa. Lisboa. 1797— B.M.; Camb.U.; Edinb.R.S.; Geol.S.i.; N.H.M.; Oxon.B.; R.A.S.; R.C.Surg.i.; R.Geogr.S.i.; R.S.i.; S.K.i.  
*See Lisb. Mm. Ac. Sc.*
- Lisb. Act.** ..... Actas das Sessões da Academia Real das Sciencias de Lisboa. Lisboa. 1849—51. B.M.; Dub.R.I.A.; Dub.T.C.; Glasg.P.S.i.; N.H.M.; R.S.
- Lisb. A. Mar.** ..... Annaes maritimos e colonias. Lisboa. 1840—45. N.H.M.; Oxon.B.i.; R.Geogr.S.i.
- Lisb. J. Sc. Mth.** ..... Jornal de Sciencias mathematicas, physicas e naturaes. Publicado sob os auspicios da Academia R. das Sciencias de Lisboa. Lisboa. 1868— B.M.; Camb.U.; Dub.R.D.S.i.; Edinb.R.S.i.; Geol.S.; Linn.S.; Math.S.i.; N.H.M.; Oxon.B.; R.A.S.; R.Geogr.S.; R.S.; U.C.L.i.

## List of Serial Publications

- Lisb. Mm. Ac. Sc.** ..... *See Lisb. Ac. Sc. Mm.*  
**L. Md. Pa. J.** ..... The Medical and Physical Journal. London.  
 1799—1833. B.M.; Camb.U.i.; Chem.S.i.; Edinb.U.; Oxon.B.;  
 Oxon.R.; Pharm.S.i.; R.C.Surg.
- L. Mth. S. P.** ..... Proceedings of the London Mathematical Society. London.  
 1865— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.;  
 Edinb.R.S.; Edinb.U.; Glasg.U.; Math.S.; Oxon.B.i.; Oxon.R.;  
 R.S.; S.K.; U.C.L.
- Lndw. Jb.** ..... Landwirthschaftliche Jahrbücher. Berlin.  
 1872— [*Continuation of: Annalen der Landwirthschaft, 1843—71.*]  
 B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Linn.S.i.; Oxon.B.;  
 P.O.; R.S.; S.K.
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 1859— B.M.i.; Camb.U.; Chem.S.i.; Glasg.U.i.; Oxon.B.; P.O.i.;  
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- L. Od. S. T.** ..... *See Dresden Lndw. V.-St.*  
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 1856— B.M.; Camb.U.; Geol.S.i.; Glasg.P.S.i.; Oxon.B.;  
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- Louvain A. Ac.** ..... Annales Academiæ Lovaniensis. Bruxelles, Louvain.  
 1821—27. B.M.; Camb.U.; Dub.T.C.; Oxon.B.; R.S.
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 P.O.i.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
- Lpool. Md. Chir. J.** ..... Liverpool Medico-Chirurgical Journal. Liverpool.  
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- L. Pa. S. P.** ..... Proceedings of the Physical Society of London. London.  
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 Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Math.S.; Oxon.B.; Oxon.R.;  
 P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Lucca At. Ac.** ..... Atti della R. Accademia Lucchese di Scienze, Lettere ed Arti. Lucca.  
 1821— B.M.; Camb.U.; Dub.T.C.i.; Oxon.B.i.
- Lum. Élect.** ..... La Lumière Electrique. Journal universel d'Électricité. Paris.  
 1879—94. B.M.; Glasg.U.i.; I.CE.; P.O.; S.K.i.
- Lund. Acta Un.** ..... Acta Universitatis Lundensis. Lunds Universitets Års-skrift.  
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 1864— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.;  
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- Lund Phys. Sällsk. Årsb.** ..... Physiographiska Sällskapets Årsberättelse. Lund.  
 1823—24. R.S.i.
- Lund Phys. Sällsk. Ts...** ..... Physiografiska Sällskapets Tidskrift. Lund.  
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- Lund. Un. Acta** ..... *See Lund. Acta Un.*
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**Lux. Pb. L.** ..... Section des Sciences Naturelles et Mathématiques: ci-devant  
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 1870— Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.i.; N.H.M.;  
 R.S.i.
- Lux. S. Sc. Mm.** ..... Société des Sciences Naturelles du Grand-Duché de Luxembourg.  
**Lux. S. Sc. Nt.** ..... Luxembourg.  
 1853—69. Dub.R.I.A.; R.S.
- Lyon Ac. Mm.** ..... Mémoires de l'Académie des Sciences, Belles-Lettres et Arts de  
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**Lyon Ac. Sc. Mm.** ..... 1845— B.M.; Camb.U.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.B.;  
 R.S.i.; S.K.i.
- Lyon A. S. L.** ..... *See Lyon Mm. Ac.*  
 Annales de la Société Linnéenne de Lyon. Lyon.  
 1836— B.M.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Linn.S.i.;  
 N.H.M.; Oxon.B.i.(R.); R.S.i.; S.K.i.
- Lyon Mm. Ac.** ..... } *See Lyon Ac. Mm.*  
**Lyon Mm. Ac. Sc.** ..... }  
**Lyon S. Ag. A.** ..... Annales des Sciences physiques et naturelles, d'Agriculture et  
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 1838—67.  
 Annales de la Société d'Agriculture, Histoire Naturelle et Arts  
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 1868— B.M.; Camb.U.; Dub.R.I.A.; Linn.S.; N.H.M.; Oxon.B.;  
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- Lyon S. Sc. Md. Mm.** ... Mémoires et Comptes-Rendus de la Société des Sciences Médicales  
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 1862— Glasg.P.S.i.; R.C.Surg.i.
- Lyon Un. A.** ..... Annales de l'Université de Lyon. Paris, Lyon.  
 1891— B.M.; Edinb.R.S.; N.H.M.i.; R.S.i.
- Mâcon Ac. A.** ..... Annales de l'Académie de Mâcon, Société des Arts, Sciences, Belles-  
 Lettres et d'Agriculture. Mâcon.  
 1851— B.M.; R.S.i.
- Mâcon S. Ag. C. R.** ..... }  
**Mâcon S. C. R.** ..... } Compte Rendu des Travaux de la Société (d'Agriculture,) des  
 Sciences, Arts et Belles-Lettres de Mâcon. Mâcon.  
 1807—52. B.M.i.; R.S.i.
- Madras Eng. Rp.** ..... Reports, etc. on various professional subjects connected with the  
 duties of the Corps of Engineers of the Madras Presidency;  
 Capt. J. T. Smith, F.R.S. Madras.  
 1839—46. I.CE.; P.O.; R.S.
- Madras J.** ..... The Madras Journal of Literature and Science. Madras.  
 1833— B.M.i.; Camb.U.; Dub.N.L.I.i.; Geol.S.i.; Linn.S.i.;  
 N.H.M.; Oxon.B.i.; P.O.; R.A.S.i.; R.Geogr.S.i.; R.S.i.;  
 S.K.i.; U.C.L.i.
- Madrid Ac. Cl. Mm.** ..... Memorias de la Real Academia de Ciencias. Madrid.  
 1850— B.M.; Camb.U.i.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.;  
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- Madrid A. H. Nt.** ..... *See Madrid Mm.*  
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 1799—1804. B.M.; N.H.M.; R.S.
- Madrid Mm.** ..... *See Madrid Ac. Cl. Mm.*
- Madrid Rv.** ..... Revista de los Progresos de las Ciencias exactas, físicas, y naturales.  
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- Madrid S. H. Nt. A.** ..... Anales de la Sociedad Española de Historia Natural. Madrid.  
 1872— Camb.U.; Glasg.P.S.i.; N.H.M.; R.S.
- Mag. Ak. Éta.** ..... Magyar Akadémiai Értesítő. [Report of the Hungarian Academy.]  
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 1840—59. B.M.
- Mag. Ak. Éta. (Mth. Term.)** Magyar Akadémiai Értesítő. A matematikai és természettudo-  
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- Magendie J. de Fl.** ..... Journal de Physiologie, expérimentale et pathologique; Magendie. Paris. 1821—31. Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.i.; R.C.Surg.; R.S.; U.C.L.
- Mag. Tud. Ak. Étk. (Mth.)** ..... Értekezések a Matematikai Osztály köréből. Kiadja a Magyar Tudományos Akadémia. [Memoirs on Mathematical subjects. Published by the Hungarian Academy of Science.] Pest. 1867—94. B.M.; Edinb.R.S.i.; Geol.S.i.; R.S.; S.K.i.
- Mag. Tud. Ak. Étk. (Termt.)** ..... Értekezések a Természettudományok köréből. Kiadja a Magyar Tudományos Akadémia. [Memoirs on Natural Science subjects. Published by the Hungarian Academy of Science.] Pest. 1867—94. B.M.; Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.i.; N.H.M.; R.Geogr.S.i.; R.S.; S.K.i.
- Mag. Tud. Ak. Éta.** ..... A Magyar Tudományos Akadémia Értesítője. [Report of the Hungarian Academy of Science.] Pest. 1867— B.M.; R.Geogr.S.i.; R.S.i.; S.K.i.
- Mag. Tud. Ak. Évk.** ..... A' Magyar Tudós Társaság' Évkönyvei. Pest. 1833—46. A' Magyar Tudományos Akadémia Évkönyvei. Budá. 1860—89. B.M.; Edinb.R.S.i.; Geol.S.i.; N.H.M.; Oxon.B.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.  
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- Majocchi A. Fis. C.** ..... Annali di Fisica, Chimica, e Matematiche, col Buletтино dell' Industria meccanica e chimica; Majocchi. Milano. 1841—50. B.M.; R.S.
- Malpighia** ..... Malpighia. Rassegna mensile di Botanica. Messina, Genova. 1886— B.M.; Camb.U.; Linn.S.; N.H.M.
- Manch. Gl. S. T.** ..... Transactions of the Manchester Geological Society. London. 1841— B.M.; Camb.U.i.; Dub.T.C.; Edinb.R.S.i.; Geol.M.; Geol.S.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.S.; U.C.L.
- Manch. Lt. Ph. S. Mem.** ..... Memoirs of the Literary and Philosophical Society of Manchester. London, Manchester. 1785—1887. [Continued as: Memoirs and Proceedings, etc., 1888—] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.; Linn.S.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.  
See **Manch. Mem. Ph. S. and Manch. S. Mem.**
- Manch. Lt. Ph. S. Mem. & P.** ..... Memoirs and Proceedings of the Manchester Literary and Philosophical Society. Manchester. 1888— [Continuation of: Memoirs, etc., 1785—1887, and Proceedings, etc., 1857—87.] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.P.S.; Glasg.U.; I.CE.; Linn.S.; Math.S.; M.O.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Manch. Lt. Ph. S. P.** ..... Proceedings of the Literary and Philosophical Society of Manchester. Manchester. 1857—87. [Continued as: Memoirs and Proceedings, etc., 1888—] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.; Linn.S.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.  
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- Manch. Micr. S. Rp.** ..... Manchester Microscopical Society. Annual Report. Manchester. 1880—84. [Continued as: Transactions, etc., 1884—] Edinb.R.S.i.; Glasg.P.S.i.; N.H.M.i.; P.O.; S.K.i.
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- Manch. Mem. Ph. S.** ..... } See **Manch. Lt. Ph. S. Mem.**
- Manch. Ph. S. Mem.** ..... } See **Manch. Lt. Ph. S. Mem.**
- Manch. Ph. S. P.** ..... } See **Manch. Lt. Ph. S. P.**
- Manch. S. Mem.** ..... } See **Manch. Lt. Ph. S. Mem.**



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- Manch. S. F.** ..... See **Manch. Lt. Ph. S. F.**
- Marb. Schr.** ..... Schriften der Gesellschaft zur Beförderung der gesammten Naturwissenschaften zu Marburg. Marburg.  
1823— B.M.i.; Camb.U.; N.H.M.; Oxon.R.; R.S.i.; S.K.i.
- Marseille Mem. S. Ém.** ... Mémoires de la Société d'Emulation de la Provence. Marseille.  
1861—66. B.M.; Glasg.P.S.i.; N.H.M.
- Mars. Fac. Sc. A.** ..... Annales de la Faculté des Sciences de Marseille. Marseille, Paris.  
1891— B.M.; Camb.P.S.; Dub.R.I.A.; Edinb.R.S.; Glasg.P.S.; Linn.S.; Math.S.i.; N.H.M.; R.A.S.; R.S.
- Maryland Ac. T.** ..... Transactions of the Maryland Academy of Sciences and Letters. Baltimore.  
1837. Glasg.P.S.i.; R.S.
- Maryland Ge. Sv.** ..... Maryland Geological Survey. Baltimore.  
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- Mathesis** ..... Mathesis. Recueil Mathématique.... Gand, Paris.  
1881— B.M.; Camb.U.
- Mbl. Nt.** ..... Maandblad voor Natuurwetenschappen, uitgegeven door de Sectie voor Natuurwetenschappen van het Genootschap ter Bevordering van Natuur-, Genees- en Heelkunde. Amsterdam.  
1871— N.H.M.
- Micro. J.** ..... Quarterly Journal of Microscopical Science; Lankester and Busk. London.  
1853— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Dub.R.C.S.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Micro. S. J.** ..... See **J. Micro. Sc. and Q. J. Micro. Sc.**  
Journal of the Royal Microscopical Society. London.  
1878— [Continuation of: The Monthly Microscopical Journal, 1869—77.] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.C.Surg.; R.S.i.; S.K.; U.C.L.
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- Med. Chir. S. F.** ..... Proceedings of the Royal Medical and Chirurgical Society of London. London.  
1857— B.M.; Camb.U.; Edinb.R.S.; Glasg.P.S.i.; Oxon.B.i.; Oxon.R.; Pharm.S.i.; R.C.Surg.; R.S.; U.C.L.
- Med. Chir. T.** ..... Medico-Chirurgical Transactions, published by the [Royal] Medical and Chirurgical Society of London. London.  
1809— B.M.; Camb.U.; Dub.R.D.S.; Edinb.R.S.i.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.; Oxon.B.; Oxon.R.; Pharm.S.i.; R.C.Surg.; R.S.; U.C.L.
- Med. C. Us.** ..... Medicinisch-chemische Untersuchungen: aus dem Laboratorium für angewandte Chemie zu Tübingen; Hoppe-Seyler. Berlin.  
1866—71. B.M.; Camb.U.; Chem.S.; Edinb.U.; R.C.Surg.; R.S.
- Med. Jb.** ..... Medizinische Jahrbücher. Herausg. von der K. K. Gesellschaft der Aerzte in Wien. Wien.  
1861— [Continuation of: Zeitschrift der K. K. Gesellschaft, etc., 1844—60.] Camb.U.i.; Glasg.P.S.i.; Pharm.S.i.; R.C.Surg.
- Meckel Arch.** ..... Archiv für Anatomie und Physiologie; Meckel. Leipzig.  
1826—32. [Continued as: Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin, 1834—76.] B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.; N.H.M.; Oxon.R.; R.C.Surg.; R.S.; U.C.L.i.
- Meckl. Vr. Nt. Arch.** ... Archiv des Vereins der Freunde der Naturgeschichte in Mecklenburg. Neubrandenburg.  
1847— Camb.U.; Linn.S.i.; N.H.M.; R.S.i.
- Medley I. Eng.** ..... See **Meckl. Arch.**
- Medley Prof. Pp. I. Eng.** { Professional Papers on Indian Engineering; Major J. G. Medley. Roorkee.  
1864—86. I.CE.; P.O.i.; R.S.i.

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- Mech. I. P.** ..... Institution of Mechanical Engineers. Proceedings. Birmingham, London.  
1847— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.D.S.; Glasg.P.S.; Glasg.U.; I.CE.; Oxon.R.i.; P.O.; R.S.; S.K.i.; U.C.L.  
*See I. M.E. P.*
- Meisner A.** ..... Annalen der allgemeinen Schweizerischen Gesellschaft für die gesammten Naturwissenschaften; Meisner. Bern.  
1824—25. B.M.; Linn.S.; N.H.M.; R.S.
- Meisner A.** ..... Naturwissenschaftlicher Anzeiger der allgemeinen Schweizerischen Gesellschaft für die gesammten Naturwissenschaften; Meisner. Aarau, Bern.  
1818—23. B.M.; Glasg.P.S.i.; N.H.M.  
*See Meckl. Vr. Mt. Arch.*
- Meckl. Arch.** ..... The Messenger of Mathematics. Cambridge, London.  
1862— B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.i.; Dub.R.C.S.i.; Dub.R.D.S.i.; Edinb.R.S.i.; Edinb.U.; Glasg.U.; Math.S.i.; Oxon.B.; Oxon.R.; R.S.; S.K.; U.C.L.
- Metaxà A. Md. Chir.** ... Annali Medico-Chirurgici; Metaxà. Roma.  
1839—46. B.M.; Glasg.P.S.i.; Oxon.B.
- Mé-et-L. Mm. S. Ac.** ..... Mémoires de la Société Académique de Maine et Loire. Angers,  
**Mé-et-L. S. Ac. Mm.** ..... 1857—83. [*Continued as: Mémoires de l'Académie des Sciences et Belles-Lettres d'Angers, 1890—95.*] B.M.; Camb.U.; N.H.M.; R.S.i.
- Mét. S. QJ.** ..... Quarterly Journal of the [Royal] Meteorological Society. London.  
1873— [*Continuation of: Proceedings of the British Meteorological Society, 1861—71.*] Camb.U.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Geol.S.; Glasg.U.; I.CE.; Linn.S.i.; M.O.; Oxon.R.; P.O.; R.A.S.; R.Geogr.S.i.; R.S.
- Mét. Z.** ..... Meteorologische Zeitschrift. Berlin.  
1884— Camb.U.; Edinb.R.S.; M.O.; P.O.; R.Geogr.S.; R.S.; S.K.
- Metz As. Mm.** ..... Mémoires de l'Académie (Royale, Impériale) de Metz. Metz.  
**Metz Mm. As.** ..... 1821— B.M.; Camb.U.; Dub.T.C.; N.H.M.; Oxon.B.; R.S.i.; S.K.
- Méx. Bl. Gg.** ..... Boletín del Instituto Nacional [de la Sociedad Mexicana] de Geografía y Estadística de la República Mexicana. México.  
**Méx. Gg. Bl.** ..... 1850—66. B.M.; Oxon.B.i.; R.Geogr.S.i.  
Boletín de la Sociedad de Geografía y Estadística de la República Mexicana. México.  
1869— B.M.; Edinb.R.S.i.; R.Geogr.S.i.
- Méx. Obs. Bl.** ..... Ministerio de Fomento de la República Mexicana. Boletín mensual del Observatorio Meteorológico-Magnético central de México. México.  
1888— Edinb.R.S.; Glasg.P.S.i.; M.O.
- Méx. S. "Alzate" Mm.** ..... Memorias de la Sociedad Científica "Antonio Alzate." México.  
1887— B.M.i.; Camb.P.S.; Dub.R.I.A.; Edinb.R.S.; Glasg.U.i.; Linn.S.i.; Math.S.i.; M.O.; N.H.M.i.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- Mg. NH.** ..... The Magazine of Natural History, and Journal of Zoology, Botany, Mineralogy, Geology, and Meteorology. London.  
1829—40. [*Continued as: Annals and Magazine of Natural History, 1841—*] B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.i.; R.S.; U.C.L.i.
- Mg. Ntvd.** ..... Magazin for Naturvidenskaberne; Lundh, etc. Christiania.  
1823—36. [*Continued as: Nytt Magazin, etc., 1838—*] B.M.; N.H.M.i.; R.S.
- Mg. Phm.** ..... Magazin für die neuesten Erfahrungen, Entdeckungen und Berichtigungen im Gebiete der Pharmacie, etc. Karlsruhe, Heidelberg.  
1823—24. [*Continued as: Magazin für Pharmacie und die dahin einschlagenden Wissenschaften, 1824—31.*] Glasg.P.S.i.; R.C. Surg.; R.S.
- Mh. C.** ..... Monatshefte für Chemie und verwandte Theile anderer Wissenschaften. Gesammelte Abhandlungen aus den Sitzungsberichten der K. Akademie der Wissenschaften. Wien.  
1880— Camb.U.i.; Chem.S.; Glasg.P.S.i.; Glasg.U.i.; Pharm.S.; P.O.

## List of Serial Publications

- Mh. Mth. Pa.** ..... Monatshefte für Mathematik und Physik. Wien.  
1890— B.M.; Camb.U.; Edinb.U.; Math.S.i.; N.H.M.
- MIL. Natist.** ..... The Midland Naturalist. London, Birmingham.  
1878—98. Camb.U.; Geol.M.; Geol.S.i.; Linn.S.; N.H.M.; P.O.; S.K.
- MIL. At. Aten.** ..... Atti dell' Ateneo, già Accademia fisico-medico-statistica di Milano.  
Milano.  
1859—67. Glasg.P.S.i.
- MIL. At. Cagnola** ..... Atti della Fondazione Scientifica Cagnola dalla sua Istituzione in poi. Milano.  
1856— B.M.; Glasg.P.S.i.; N.H.M.i.; R.S.i.; S.K.i.
- MIL. At. I. Lomb.** ..... Atti dell' I. R. Istituto Lombardo di Scienze, Lettere ed Arti.  
Milano.  
1858—64. [Continuation of: Giornale, etc., 1841—56.] [Continued as: Rendiconti, etc., 1864—] B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; I.CE.i.; N.H.M.; Oxon.B.; R.Geogr.S.i.; R.S.
- MIL. At. S. It.** ..... Atti della Società Italiana di Scienze Naturali. Milano.  
1855— B.M.; Camb.U.; Edinb.R.S.i.; N.H.M.; P.O.i.; R.S.; S.K.i.  
See **MIL. S. It. At.**
- MIL. Effem.** ..... { Effemeridi Astronomiche di Milano. Con Appendice di Osservazioni  
e Memorie Astronomiche. Milano.  
1806— Camb.U.; Oxon.B.; R.A.S.i.
- MIL. Effem. As.** ..... {
- MIL. G. I. Lomb.** ..... Giornale dell' I. R. Istituto Lombardo di Scienze, Lettere ed Arti e Biblioteca Italiana; compilata da varj dotti nazionali e stranieri.  
Milano.  
1841—56. [Continued as: Atti, etc., 1858—64.] B.M.; Geol.S.i.; I.CE.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.  
See **MIL. I. Lomb. G.**
- MIL. G. S. Inc.** ..... Giornale della Società d' Incoraggiamento delle Scienze, etc. stabilità in Milano. Milano.  
1808—65. B.M.; Camb.U.
- MIL. I. Lomb. G.** ..... See **MIL. G. I. Lomb.**
- MIL. I. Lomb. Mem.** ..... Memorie dell' I. R. Istituto Lombardo di Scienze, etc. Milano.  
1843— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.i.; Geol.S.; I.CE.i.; Math.S.i.; N.H.M.; Oxon.B.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.  
See **MIL. Mem. I. Lomb.**
- MIL. I. Lomb. Rd.** ..... Reale Istituto Lombardo di Scienze e Lettere. Rendiconti. Milano.  
1864— [Continuation: of Atti, etc., 1858—64.] B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; Math.S.i.; N.H.M.; Oxon.B.i.; R.A.S.i.; R.Geogr.S.; R.S.; S.K.i.; U.C.L.i.
- MIL. Mem. I. Lomb.** ..... See **MIL. I. Lomb. Mem.**
- MIL. Mem. I. Lomb. Ven.** ..... Memorie dell' I. R. Istituto del regno Lombardo-Veneto. Milano.  
1819—38. B.M.; Camb.U.; I.CE.; N.H.M.; Oxon.B.i.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.
- MIL. S. It. At.** ..... See **MIL. At. S. It.**
- Minn. Ac. Sc. Ill.** ..... Bulletin of the Minnesota Academy of Natural Sciences. Minneapolis, Minn.  
1874— B.M.; Geol.S.i.; N.H.M.; S.K.i.
- Miquel Bil.** ..... Bulletin des Sciences Physiques et Naturelles en Néerlande; Miquel, Mulder, Wenckebach. Leyden, Rotterdam.  
1838—40. B.M.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; R.S.
- Mitau Arb. Kurländ. Ges.** ..... Arbeiten der Kurländischen Gesellschaft für Literatur und Kunst.  
Mitau.  
1847—51. B.M.; Camb.U.
- M. Micr. J.** ..... The Monthly Microscopical Journal. London.  
1869—77. [Continuation of: Transactions of the Microscopical Society of London, 1844—68.] [Continued as: Journal of the Royal Microscopical Society, 1878—] B.M.; Camb.U.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.U.; N.H.M.; Oxon.R.; P.O.; R.C.Surg.; R.S.; U.C.L.
- Mem. Fis. Speriment.** ..... Memorie di Fisica sperimentale. Modena.  
1837—38. Glasg.P.S.i.
- Mem. Ge. Sv.** ..... Memoirs of the Geological Survey of Great Britain and of the Museum of Economic Geology in London. London.  
1846— Camb.U.; Dub.R.C.S.; Dub.T.C.; Edinb.R.S.; Edinb.U.;

## List of Serial Publications

- Geol.M.; Geol.S.; Glasg.U.i.; I.CE.; N.H.M.; Oxon.B.; Oxon.R.;  
P.O.; R.S.; S.K.; U.C.L.
- See Gl. Sv. Mem.*
- Mem. Méd. MIL** ..... Recueil de Mémoires de Médecine, de Chirurgie, et de Pharmacie Militaires, rédigé sous le surveillance du Conseil de Santé. Paris.  
1815—82. [*Continued as*: Archives de Médecine et de Pharmacie Militaires, 1883—] B.M.; Glasg.U.i.; R.C.Surg.
- Mem. Mg.** ..... The Mineralogical Magazine and Journal of the Mineralogical Society of Great Britain and Ireland. Truro, London.  
1876— B.M.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Geol.M.; Geol.S.; Glasg.U.; N.H.M.; Oxon.B.(R.); P.O.; R.S.; S.K.
- Memtp. A. Clin.** ..... Annales Cliniques de la Société Médicale Pratique de Montpellier. Montpellier.  
1818—20. B.M.; Glasg.P.S.i.; R.C.Surg.
- Memtp. Ac. Mem.** ..... Académie des Sciences et Lettres de Montpellier. Mémoires de la Section des Sciences. Montpellier.
- Memtp. Ac. Sc. Mem.** ..... 1847— B.M.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Linn.S.i.; N.H.M.; Oxon.B.; R.A.S.; R.S.; U.C.L.i.
- Memtp. Mem. Ac.** ..... 1847— B.M.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Linn.S.i.; N.H.M.; Oxon.B.; R.A.S.; R.S.; U.C.L.i.
- Memtp. Mem. Ac. Sect. Sc.** ..... Recueil des Bulletins publiés par la Société Libre des Sciences, etc. de Montpellier. Montpellier.
- Memtp. Rec. MIL** ..... 1803—14. B.M.; Camb.U.; Oxon.B.i.
- Memtp. S. Lang. Gg. MIL** ..... Société Languedocienne de Géographie. Bulletin. Montpellier.  
1878— B.M.; R.Geogr.S.
- Mod. Ac. Sc. Mem.** ..... Memorie della Regia Accademia di Scienze, Lettere ed Arti di Modena. Modena.  
1833— B.M.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Math.S.i.; N.H.M.; Oxon.B.i.; S.K.i.; U.C.L.i.
- See Mod. Mem. Ac. Sc.*
- Mod. An. S. Mt.** ..... Annuario della Società dei Naturalisti in Modena. Modena.  
1866—82. [*Continued as*: Atti della Società, etc., 1883—] Camb.U.; Dub.R.I.A.i.; Edinb.R.S.i.; Glasg.P.S.i.; N.H.M.; R.S.
- See Mod. S. Mt. An.*
- Mod. Mem. Ac. Sc.** ..... *See Mod. Ac. Sc. Mem.*
- Mod. Mem. S.** ..... Memorie di Matematica e di Fisica della Società Italiana delle Scienze. Modena.
- Mod. Mem. S. It.** ..... 1782— B.M.i.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Glasg.U.i.; Linn.S.i.; Oxon.B.i.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.i.; U.C.L.i.
- See Mod. S. It. Mem., Mem. S. It. Mem., and Verona Mem. S. It.*
- Mod. Relazione** ..... Relazione delle Adunanze della R. Accademia di Scienze, Lettere ed Arti di Modena. Modena.  
1842—43. Glasg.P.S.i.; R.S.
- See Mod. Mem. S., Mem. S. It. Mem., and Verona Mem. S. It.*
- Mod. S. It. Mem.** ..... *See Mod. Mem. S., Mem. S. It. Mem., and Verona Mem. S. It.*
- Mod. S. Mt. An.** ..... *See Mod. An. S. Mt.*
- Mod. S. Mt. At.** ..... Atti della Società dei Naturalisti di Modena. Modena.  
1883— [*Continuation of*: Annuario, etc., 1866—82.] Camb.U.; Dub.R.I.A.i.; N.H.M.
- Mod. S. Mt. At. (Rd.)** ... Atti della Società dei Naturalisti di Modena. Rendiconti delle Adunanze. Modena.  
1882—86. B.M.; Camb.U.; Glasg.P.S.i.; N.H.M.
- Moigno Cosmos** ..... Cosmos. Revue Encyclopédique Hebdomadaire des Progrès des Sciences; Moigno. Paris.  
1852—70. B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; I.CE.i.; N.H.M.; Oxon.B.; P.O.; R.A.S.i.; R.S.; S.K.i.
- See Cosmos.*
- Moleschott Ua.** ..... Untersuchungen zur Naturlehre des Menschen und der Thiere; Moleschott. Frankfurt-am-Main, Giessen.  
1857— B.M.; Camb.U.i.; Glasg.P.S.i.; N.H.M.; Oxon.R.; R.O. Surg.; R.S.i.
- Moncalieri Oss. MIL** ..... Bullettino Meteorologico dell' Osservatorio del R. Collegio Carlo Alberto in Moncalieri. Torino.  
1866— Glasg.P.S.i.; M.O.; R.A.S.i.
- See Les Mondes.*
- Mondes (les)** ..... *See Les Mondes.*
- Mon. Sc.** ..... Le Moniteur Scientifique; Quesneville. Paris.  
1857— B.M.; Chem.S.i.; Dub.R.C.S.i.; Oxon.B.; Pharm.S.i.; P.O.; R.A.S.i.

## List of Serial Publications

- Mosc. Bil. S. Nt.**..... Bulletin de la Société Impériale des Naturalistes. Moscou.  
1829— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.;  
Dub.R.I.A.; Edinb.R.S.i.; Geol.S.; Glasg.U.i.; Linn.S.; N.H.M.;  
Oxon.B.i.; Oxon.R.; P.O.i.; R.A.S.i.; R.C.Surg.i.; R.S.;  
S.K.  
*See Mosc. S. Nt. Bil.*
- Mosc. Cm. S. Pa. Md.** ... Commentationes Societatis Physico-Medice apud Universitatem  
Mosquensem Institutæ. Mosquæ.  
1808—21. B.M.; Glasg.P.S.i.; R.S.i.; S.K.i.
- Mosc. N. Mm.**..... Nouveaux Mémoires de la Société Impériale des Naturalistes de  
Moscou. Moscou.  
1829— B.M.; Camb.U.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.;  
N.H.M.; Oxon.R.i.; R.C.Surg.i.; R.S.i.; S.K.i.  
*See Mosc. S. Nt. N. Mm.*
- Mosc. Obs. A.**..... Annales de l'Observatoire de Moscou; Bredichin. Moscou.  
1874— B.M.i.; Camb.U.; R.A.S.; R.S.  
*See Mosc. Bil. S. Nt.*
- Mosc. S. Nt. Bil.**..... Mémoires de la Société Impériale des Naturalistes de Moscou.  
Moscou.  
1806—23. B.M.; Camb.P.S.i.; Camb.U.; Dub.R.I.A.; Geol.S.;  
Glasg.P.S.i.; Linn.S.i.; N.H.M.; R.S.i.; S.K.i.
- Mosc. S. Nt. N. Mm.** ... *See Mosc. N. Mm.*
- Mosc. S. Sc. Bil.**..... Bulletin of the Imperial Society of Lovers of Natural Science,  
Anthropology and Ethnography, in connection with the Imperial  
University of Moscow. [In Russian.] Moscow.  
1865— B.M.i.; Edinb.R.S.i.; N.H.M.i.; R.C.Surg.i.
- Mosc. Un. Mm.**..... Scientific Memoirs of the Imperial University of Moscow. [In  
Russian.] Moscow.  
1893—36. B.M.i.; N.H.M.i.
- Mosc. Un. Mm. (Ps.-  
Mth.)**..... Scientific Memoirs of the Imperial University of Moscow. Physico-  
Mathematical Section. [In Russian.] Moscow.  
1880—96. Chem.S.; Glasg.P.S.i.; N.H.M.
- Mt. Blanc Obs. A.**..... Annales de l'Observatoire Météorologique [Physique et Glaciaire] du  
Mont Blanc. Paris.  
1893— B.M.; Camb.U.; Dub.R.D.S.i.; Edinb.R.S.; M.O.; Oxon.B.;  
R.S.; S.K.
- Mth. A.**..... Mathematische Annalen; Clebsch. Leipzig.  
1869— B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.i.; Dub.R.C.S.i.;  
Dub.R.D.S.i.; Dub.T.C.i.; Edinb.U.; Glasg.U.; Math.S.; Oxon.B.;  
R.S.; S.K.; U.C.L.
- Mth. Nt. B. Ung.**..... Mathematische und naturwissenschaftliche Berichte aus Ungarn.  
Berlin.  
1882— Camb.P.S.; Chem.S.; Edinb.R.S.; Glasg.U.i.; R.A.S.i.;  
R.Geogr.S.i.; R.S.; S.K.
- Mth. Term. Éts.**..... {  
**Mth. Term. Éts.**..... {  
Mathematikai és természettudományi Értesítő. Kiadja a Magyar  
Tudományos Akadémia. [Mathematical and Natural Science  
Report, published by the Hungarian Academy of Science.]  
Budapest.  
1883— B.M.i.; Edinb.R.S.; N.H.M.; R.S.
- Mth. Ts.**..... Mathematisk Tidsskrift. Kjøbenhavn.  
1859—64. [Continued as: Tidsskrift for Matematik, 1865—] B.M.;  
Camb.U.; Math.S.i.; Oxon.B.; R.S.i.
- Mt. Ostld.**..... Mittheilungen aus dem Osterlande. Altenburg.  
1837— Camb.U.i.; N.H.M.
- Mulder Arch.**..... Natuur- en Scheikundig Archief; Mulder, Wenckebach. Rotterdam,  
Leijden.  
1833—38. B.M.; Edinb.R.S.; Glasg.P.S.i.; R.S.
- Mulhouse Bil.**..... {  
**Mulhouse Bil. S. In.**..... {  
**Mulhouse S. In. Bil.**..... {  
Bulletin de la Société Industrielle de Mulhouse. Mulhouse.  
1828— B.M.i.; Camb.U.i.; Chem.S.i.; Dub.R.C.S.i.; Dub.T.C.i.;  
Glasg.P.S.i.; Glasg.U.i.; I.CE.; Oxon.B.i.; P.O.
- Müller Arch.**..... Archiv für Anatomie, Physiologie, und wissenschaftliche Medicin;  
Müller, Reichert, Du Bois-Reymond. Berlin.  
1834—76. [Continuation of: Archiv für Anatomie und Physiologie,  
1826—32.] [Continued as: Archiv für Anatomie und Physiologie,  
1877—] B.M.; Camb.U.; Edinb.U.; Glasg.P.S.i.; Glasg.U.;  
N.H.M.; Oxon.B.; R.C.Surg.; R.S.; S.K.; U.C.L.  
*See Arch. An. Fl. and Reichert Arch.*

## List of Serial Publications

- Münch. Ab.** ..... (Abhandlungen der mathematisch-physikalischen Classe der Königl. Bayerischen Akademie der Wissenschaften. München. 1829— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.U.; I.CE.i.; Linn.S.; Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.)
- Münch. Ak. Ab.** ..... (Sitzungsberichte der Königl. Bayerischen Akademie der Wissenschaften zu München. München. 1860—70. B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Geol.S.; I.CE.; Linn.S.; N.H.M.; Oxon.B.; P.O.i.; R.A.S.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.)
- Münch. Ak. Sb.** ..... (Sitzungsberichte der Mathematisch-Physikalischen Classe der K. B. Akademie der Wissenschaften zu München. München. 1871— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.R.S.; Glasg.U.i.; I.CE.i.; Linn.S.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.)
- Münch. Bil. Ak.** ..... (Bulletin der k. Akademie der Wissenschaften. München. 1843—53. B.M.i.; Edinb.R.S.i.; I.CE.i.; Oxon.B.i.; R.A.S.; R.Geogr.S.i.; R.S.)
- Münch. D.** ..... (Denkschriften der Königl. Bayerischen Akademie der Wissenschaften zu München. München, Salzbaoh. 1808—24. B.M.; Camb.P.S.; Camb.U.; Geol.S.i.; Glasg.U.; N.H.M.; Oxon.R.; P.O.; R.C.Surg.; R.S.; S.K.)
- Münch. Gelehrte Anz.** ... (Gelehrte Anzeigen; herausgegeben von Mitgliedern der Königl. Baierischen Akademie der Wissenschaften. München. 1835—60. B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.B.; P.O.; R.S.; S.K.)
- Münch. Ges. Mph. Pl. Sb.** (Sitzungsberichte der Gesellschaft für Morphologie und Physiologie in München. München. 1885— Camb.U.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.)
- Münch. Mt. Tech. Com. Ab.** ..... (Abhandlungen der naturwissenschaftlich-technischen Commission bei der Königl. Baierischen Akademie. München. 1857—58. Camb.U.; R.S.)
- Münch. Sb.** ..... (See **Münch. Ak. Sb.**)
- Münch. Z. Archt.** ..... (Zeitschrift des Bayerischen Architekten- und Ingenieur-Vereins. München. 1869—77. P.O.)
- N. Al. J. C.** ..... (Neues allgemeines Journal der Chemie. Berlin. 1803—06. [Continuation of: Allgemeines Journal, etc., 1798—1802.] [Continued as: Journal für die Chemie und Physik, 1806—10.] B.M.; Glasg.P.S.i.; N.H.M.; Oxon.R.; R.S.)
- N. A. Mth.** ..... (Nouvelles Annales de Mathématiques. Paris. 1842— B.M.; Camb.U.; Dub.T.C.; Edinb.U.; Glasg.U.; Math.S.i.; Oxon.B.(R.); R.S.; S.K.; U.C.L.i.)
- Nancy Mem. Ac. Stanislas** (Académie de Stanislas. Mémoires de la Société [Royale] des Sciences, etc. Nancy. 1852— [Continuation of: Mémoires de la Société, etc., 1833—51.] B.M.; Camb.U.; Geol.S.i.; Oxon.B.; R.S.i.; S.K.)
- Nancy Mem. S. Sc.** ..... (Mémoires de la Société [Royale] des Sciences, Lettres et Arts de Nancy. Nancy. 1833—51. [Continuation of: Précis analytique des Travaux de la Société, etc., 1802—32.] [Continued as: Académie de Stanislas. Mémoires, etc., 1852—] B.M.; Camb.U.i.; N.H.M.i.; Oxon.B.; R.S.i.; S.K.)
- Nancy S. Sc. Bil.** ..... (Bulletin de la Société des Sciences de Nancy. Nancy, Paris. 1873— B.M.; Geol.S.i.; N.H.M.; R.Geogr.S.i.; R.S.)
- Nancy Tr. S. Sc.** ..... (Précis analytique des Travaux de la Société [Royale] des Sciences, Arts et Agriculture de Nancy. Nancy. 1802—32. [Continued as: Mémoires de la Société, etc., 1833—51.] B.M.; Camb.U.i.; Oxon.B.; R.S.i.)
- Nantes A. S. Ac.** ..... (Annales de la Société Académique de Nantes et du Département de la Loire Inférieure. Nantes. 1830— Camb.U.; Glasg.P.S.i.; Oxon.B.)

## List of Serial Publications

- N. Antol. Sc.** ..... Nuova Antologia di Scienze, Lettere ed Arti. Firenze, Roma.  
1866— B.M.; Dub.N.L.I.i.; N.H.M.
- Nap. Ac. Asp. A.** ..... Annali dell' Accademia degli Aspiranti Naturalisti. Napoli.  
1843—47; 1861—69; 1887. Camb.U.i.; N.H.M.; R.S.i.
- Nap. Ac. At.** ..... Atti della Reale Accademia delle Scienze e Belle Lettere; Sezione della Società R. Barbonica. Napoli.  
1819—51. B.M.; Camb.U.; Dub.R.D.S.; Geol.S.i.; N.H.M.; Oxon.B.; R.A.S.i.; R.C.Surg.i.; R.S.  
Atti della R. Accademia delle Scienze Fisiche e Matematiche. Napoli.  
1868—82; 1898— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Geol.S.i.; Glasg.U.i.; Linn.S.i.; Math.S.i.; N.H.M.; Oxon.B.i.; Oxon.R.; R.A.S.i.; R.S.; S.K.i.  
*See Nap. At. Ac.*
- Nap. Ac. Pont. At.** ..... Atti dell' Accademia Pontaniana di Napoli. Napoli.  
1832— B.M.; Camb.U.; Dub.R.D.S.i.; Glasg.U.i.; N.H.M.; R.S.i.; U.C.L.i.
- Nap. Ac. Sc. Mem.** ..... Memorie della R. Accademia delle Scienze, etc. Napoli.  
1852—57. B.M.; Camb.U.; Dub.R.D.S.; Edinb.R.S.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.A.S.; R.S.
- Nap. At. Ac.** ..... } *See Nap. Ac. At.*  
**Nap. At. Ac. Sc.** ..... }  
**Nap. At. I. Inc.** ..... } Atti del Real Istituto d' Incoraggiamento alle Scienze Naturali di Napoli. Napoli.  
1811— B.M.; Camb.U.; Edinb.R.S.i.; I.CE.i.; N.H.M.; Oxon.B.; P.O.; R.C.Surg.i.; R.S.i.; S.K.i.  
*See Nap. I. Inc. At.*
- Nap. Bul. Ac. Asp.** ..... Bollettino dell' Accademia degli Aspiranti Naturalisti. Napoli.  
1842; 1861—64. Camb.U.i.; N.H.M.
- Nap. I. Inc. At.** ..... *See Nap. At. I. Inc.*
- Nap. Ma.** ..... Museo di Letteratura e Filosofia; Gatti. Napoli.  
1842—62. B.M.; Oxon.B.
- Nap. Rd.** ..... Rendiconto delle adunanze e de' lavori della Reale Accademia delle Scienze [Fis. e Mat.] di Napoli. Napoli.  
1842—57. B.M.; Camb.U.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.B.i.; Oxon.R.; R.A.S.i.; R.S.i.
- Nap. Rd.** ..... Rendiconto dell' Accademia delle Scienze Fisiche e Matematiche. Napoli.  
1862— Camb.U.; Dub.R.I.A.; Edinb.R.S.; Glasg.U.i.; Linn.S.i.; Math.S.; N.H.M.; Oxon.R.i.; P.O.; R.A.S.; R.S.; U.C.L.i.
- Nap. S. Mt. Bil.** ..... Bollettino della Società di Naturalisti in Napoli. Napoli.  
1887— B.M.; Camb.P.S.; N.H.M.; R.S.
- N. Arch. Wisk.** ..... Nieuw Archief voor Wiskunde. Amsterdam.  
1875— Camb.P.S.i.; Edinb.R.S.i.; Math.S.
- N. A. Sc. Mt.** ..... Nuovi Annali delle Scienze naturali; Alessandrini, Bertolini, Gherardi e Ranzani. Bologna.  
1838—54. Camb.U.; Geol.S.i.; N.H.M.; Oxon.B.i.; R.Geogr.S.i.; R.S.  
*See Bologna N. A.*
- Nass. Jb.** ..... Jahrbücher des Vereins für Naturkunde im Herzogthum Nassau.  
**Nass. Vr. Jb.** ..... Wiesbaden.  
1844— B.M.; Camb.P.S.i.; Camb.U.; Linn.S.; N.H.M.; R.S.i.; S.K.
- Nauche J. du Galvan.** ... Journal du Galvanisme, de Vaccine, etc.; Nauche. Paris.  
1803. B.M.; Glasg.P.S.i.
- N. Bergm. J.** ..... Neues bergmännisches Journal; Kohlen und Hoffmann. Freiberg.  
1795—1816. B.M.i.; Geol.S.i.; N.H.M.; R.S.; S.K.i.
- N. Brunsw. NH. S. Bil.** ... Bulletin of the Natural History Society of New Brunswick. St John.  
1882— Geol.S.; Glasg.P.S.i.; N.H.M.; R.S.i.
- N. Cim.** ..... Il Nuovo Cimento, Giornale di Fisica, Chimica e Storia Naturale. Pisa.  
1855— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Edinb.R.S.i.; I.CE.i.; N.H.M.; Oxon.R.i.; P.O.i.; R.S.
- Ndl. Arch. Wtk.** ..... Nederlandsch Archief voor Genees- en Natuurkunde. Utrecht.  
1865—70. [Continuation of: Archiv für die Holländischen Beiträge zur Natur- und Heilkunde, 1858—64.] B.M.; Glasg.P.S.i.; R.S.i.

## List of Serial Publications

- Ned. Gast. Oogl. Va.** ..... Nederlandsch Gasthuis voor Behoeftige en Minvermogende Ooglijders te Utrecht. Verslag. Utrecht.  
1885— [Continuation of: Jaarlijksch Verslag betrekkelijk de Verpleging en 't Onderwijs in het Nederlandsch Gasthuis voor Ooglijders; Donders, 1860—85.] R.S.
- Ned. Kruidk. Arch.** ..... Nederlandsch Kruidkundig Archief. [Verslagen en Mededeelingen der Nederlandsche Botanische Vereeniging.] Leijden, Amsterdam, Leeuwarden, Nijmegen.  
1846— B.M.i.; Edinb.R.S.i.; Linn.S.; N.H.M.; R.S.
- Ned. Lancet** ..... Nederlandsch Lancet. Tijdschrift aan de praktische Chirurgie, etc. Utrecht.  
1838—56. B.M.; Glasg.P.S.i.; R.C.Surg.i.
- Nedöster. Gewerb-Vr. Vh.** Verhandlungen des Niederösterreichischen Gewerb-Vereins. Wien.  
1840— B.M.i.; P.O.; S.K.i.
- Nebr. Un. Stud.** ..... University Studies. Published by the University of Nebraska. Lincoln, Nebraska.  
1898— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Oxon.B.; R.S.
- N. Eng. I. Min. E. T.** ..... Transactions of the North of England Institute of Mining Engineers. Newcastle-upon-Tyne.  
1852— B.M.; Camb.U.; Edinb.R.S.i.; Geol.S.; Glasg.U.i.; I.CE.; Oxon.B.i.; P.O.i.; R.S.; S.K.; U.C.L.i.
- Neuch. Bil.** ..... Bulletin de la Société des Sciences Naturelles de Neuchâtel. Neuchâtel.  
1844— B.M.i.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.i.; M.O.i.; N.H.M.; Oxon.B.i.; R.A.S.i.; R.S.i.; S.K.i.
- Newcastle C. S. T.** ..... Newcastle-upon-Tyne Chemical Society. Transactions. Newcastle-upon-Tyne.  
1868—83. B.M.; Chem.S.; Oxon.B.; Pharm.S.i.; P.O.; R.S.
- NH. Zv.** ..... The Natural History Review and Quarterly Journal of Science. London, Dublin.  
1854—60. B.M.; Camb.U.; Dub.R.D.S.; Dub.T.C.; Glasg.P.S.; Linn.S.; N.H.M.; Oxon.R.; P.O.; R.C.Surg.; S.K.; U.C.L.i.  
The Natural History Review; a Quarterly Journal of Biological Science. London.  
1861—65. B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.T.C.; Edinb.R.S.; Geol.S.; Glasg.P.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.; R.C.Surg.; R.S.; S.K.
- Nice Obs. A.** ..... Annales de l'Observatoire de Nice. Paris.  
1887— B.M.; Edinb.R.S.i.; Glasg.P.S.i.; Glasg.U.i.; R.A.S.; R.S.; S.K.
- Nicholson J.** ..... Journal of Natural Philosophy, Chemistry, and the Arts; Nicholson. London.  
1797—1813. [Continued in: The Philosophical Magazine, 1814—] B.M.; Camb.U.; Chem.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.i.; R.S.; S.K.; U.C.L.
- Nim. S. Sc. Bil.** ..... Bulletin de la Société d'Étude des Sciences Naturelles de Nîmes. Nîmes.  
1873— N.H.M.i.
- N. Jb. Min.** ..... Neues Jahrbuch für Mineralogie, Geologie und Paläontologie. Stuttgart.  
1863— [Continuation of: Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefaktenkunde, 1833—62.] B.M.; Camb.U.; Chem.S.i.; Dub.N.L.I.i.; Dub.R.D.S.i.; Geol.M.; Geol.S.; Glasg.U.; I.CE.i.; N.H.M.; Oxon.R.; R.S.; S.K.i.
- N. Mg. Ntvd.** ..... Nyt Magazin for Naturvidenskaberne. Christiania.  
1838— [Continuation of: Magazin for Naturvidenskaberne, 1823—36.] Camb.U.i.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; R.S.; S.K.
- Nord. Arch.** ..... Nordisches Archiv für Naturkunde und Arzneiwissenschaft. Kopenhagen, Frankfurt an der Oder.  
1799—1801. B.M.; Glasg.P.S.i.; R.C.Surg.
- Norm. S. L. Bil.** ..... Bulletin de la Société Linnéenne de Normandie. Caen.  
1855— B.M.; Camb.U.; Geol.S.i.; Glasg.P.S.i.; Linn.S.; N.H.M.; R.S.i.; U.C.L.i.  
See Caen S. L. Bil.



## List of Serial Publications

- N. R. S. Nt. Mm.** ..... Mémoires de la Société des Naturalistes de la Nouvelle-Russie. [In Russian.] Odessa.  
1872— B.M.; Camb.P.S.i.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; R.S.i.
- N. R. S. Nt. Mm. (Mth.)** Memoirs of the Mathematical Section of the New Russian Society of Naturalists. [In Russian.] Odessa.  
1878— Dub.R.I.A.; Math.S.i.; R.S.i.
- N. Scotia I. Sc. P. & T....** Proceedings and Transactions of the Nova Scotian Institute of Natural Science. Halifax, Nova Scotia.  
1863— Camb.P.S.i.; Chem.S.i.; Edinb.R.S.i.; Geol.S.i.; Glasg. U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Pharm.S.i.; P.O.i.; R.A.S.i.; R.Geogr.S.i.; R.S.i.; U.C.L.i.
- N. S. W. R. S. J.**..... Journal and Proceedings of the Royal Society of New South Wales. Sydney.  
1876— [Continuation of: Transactions, etc., 1867—75.] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.T.C.; Edinb.R.S.i.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.; Linn.S.i.; M.O.; N.H.M.; Oxon.B.; Oxon.R.i.; Pharm.S.i.; P.O.i.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.
- N. S. W. R. S. T.** ..... Transactions of the Royal Society of New South Wales. Sydney.  
1867—75. [Continued as: Journal and Proceedings, etc., 1876—] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.i.; Geol.M.i.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.i.
- Nt.** ..... Nature: a weekly illustrated Journal of Science. London.  
1870— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.; Dub. R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.; Linn.S.; M.O.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Ntzeza.** ..... La Naturaleza. Periódico científico de la Sociedad Mexicana de Historia Natural. México.  
1870— B.M.i.; Edinb.R.S.i.; Geol.S.i.; N.H.M.i.
- N. T. F. K.**..... Nyt Tidsskrift for Fysik og Kemi. Kjøbenhavn.  
1896—98. [Continuation of: Tidsskrift for Fysik og Chemi, 1862—94.] B.M.; Glasg.P.S.i.
- N. T. Mth.** ..... Nyt Tidsskrift for Mathematik. Kjøbenhavn.  
1890— [Continuation of: Tidsskrift for Mathematik, 1865—89.] B.M.; Math.S.i.
- Nürnb. Ab.** ..... Abhandlungen der Naturhistorischen Gesellschaft zu Nürnberg. Nürnberg.  
1852— B.M.i.; Camb.U.; Dub.R.I.A.; N.H.M.; R.S.i.; S.K.
- Nv. Archt. T.** ..... Transactions of the Institution of Naval Architects. London.  
1860— B.M.; Camb.U.; Dub.R.I.A.; Edinb.U.; Glasg.U.; I.CE.; P.O.; R.S.; S.K.i.; U.C.L.i.
- N.-Vorp. Mt.** ..... Mittheilungen aus dem Naturwissenschaftlichen Vereine von Neu-Vorpommern und Rügen. Berlin.  
1869— B.M.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; N.H.M.; R.C. Surg.i.; S.K.
- Nv. Sc.** ..... Naval Science: a Quarterly Magazine for promoting the improvement of Naval Architecture, Marine Engineering, Steam Navigation and Seamanship. London.  
1872—76. B.M.i.; Camb.U.i.; Glasg.U.i.; I.CE.i.; M.O.i.; Oxon. B.i.; P.O.; S.K.
- N. Y. Ac. A.**..... Annals of the New York Academy of Sciences, late Lyceum of Natural History. New York.  
1879— [Continuation of: Annals of the Lyceum of Natural History, 1824—77.] B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Geol.S.; Linn.S.i.; N.H.M.; Oxon.R.i.; P.O.; R.S.; S.K.; U.C.L.i.
- N. Y. Ac. T.** ..... Transactions of the New York Academy of Sciences, late Lyceum of Natural History. New York.  
1881—98. B.M.; Glasg.U.i.; Linn.S.i.; N.H.M.; Oxon.R.i.; P.O.i.; R.S.; S.K.; U.C.L.i.
- N. Y. A. Lyceum** ..... Annals of the Lyceum of Natural History of New York. New York.  
1824—77. [Continued as: Annals of the New York Academy of

## List of Serial Publications

- Sciences, 1879—] B.M.; Camb.U.; Dub.R.D.S.; Edinb.R.S.i.; Edinb.U.i.; Geol.S.i.; Linn.S.; N.H.M.; Oxon.R.i.; P.O.; R.S.; S.K.
- See N. Y. Lyceum A.**
- N. Y. Am. Math. S. Bul. ...** Bulletin of the American Mathematical Society. New York.  
1895— [Continuation of: Bulletin of the New York Mathematical Society, 1892—94.] B.M.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Glasg.P.S.; Glasg.U.; Math.S.; Oxon.B.; Oxon.R.; R.S.i.
- N. Y. Am. Math. S. T.' ...** Transactions of the American Mathematical Society. Lancaster, Pa. and New York.  
1900— Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Glasg.U.; Math.S.; Oxon.B.; Oxon.R.; R.S.; S.K.
- N. Y. Lyceum A. ....** **See N. Y. A. Lyceum.**
- N. Y. Lyceum F. ....** Proceedings of the Lyceum of Natural History in the City of New York. New York.  
1870—74. B.M.; Geol.S.; Glasg.P.S.i.; Linn.S.; N.H.M.; R.S.; S.K.i.
- N. Y. Med. J. ....** The New York Medical Journal. New York.  
1865— Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; R.C.Surg.; R.S.i.
- N. Y. Med. Rep. ....** Medical Repository of New York. New York.  
1798—1812. B.M.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.i.; U.C.L.i.
- N. Y. Ma. Bul. ....** University of the State of New York. Bulletin of the New York State Museum. Albany.  
1887— Camb.P.S.i.; Dub.R.I.A.; Edinb.R.S.; Geol.M.; Glasg.P.S.i.; Glasg.U.i.; N.H.M.; Oxon.B.; R.S.; S.K.i.
- N. Y. Math. S. Bul. ....** Bulletin of the New York Mathematical Society. New York.  
1892—94. [Continued as: Bulletin of the American Mathematical Society, 1895—] B.M.; Camb.P.S.; Camb.U.; Edinb.R.S.; Glasg.P.S.; Glasg.U.; Math.S.; Oxon.B.; Oxon.R.; R.A.S.i.
- N. Z. Col. Mus. Geol. Sv. Rp.** Colonial Museum and Geological Survey of New Zealand. Reports of Geological Explorations. Wellington.  
1870—73. [Continued as: New Zealand. Papers and Reports relating to Minerals and Mining, 1894—] B.M.; Edinb.R.S.i.; Edinb.U.i.; Geol.S.i.; I.CE.i.; Linn.S.i.; N.H.M.; P.O.i.; R.Geogr.S.i.; R.S.i.; U.C.L.i.
- N. Z. I. T. ....** Transactions and Proceedings of the New Zealand Institute. Wellington.  
1868— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.; R.S.; S.K.i.; U.C.L.i.
- N. Z. Fp. & Rp. (Min.) ...** New Zealand. Papers and Reports relating to Minerals and Mining. Wellington.  
1894— [Continuation of: Colonial Museum and Geological Survey of New Zealand. Reports of Geological Explorations, 1870—93.] Edinb.R.S.i.; Geol.S.i.; P.O.; R.Geogr.S.i.
- Obs. ....** The Observatory. A monthly Review of Astronomy. London.  
1878— Camb.P.S.; Camb.U.; Dub.T.C.i.; Edinb.R.S.; Oxon.B.; P.O.; R.A.S.; S.K.
- Oestr. Wschr. ....** Oesterreichische Wochenschrift für Wissenschaft, Kunst, und öffentliches Leben. Beilage zur K. Wiener Zeitung. Wien.  
1863—64. Glasg.P.S.i.
- Oestr. Z. Bergw. ....** Oesterreichische Zeitschrift für Berg- und Hüttenwesen; von Hingenu. Wien.  
1853— B.M.; I.CE.; P.O.; S.K.
- Offenb. Vr. Mt. B. ....** Bericht über die Thätigkeit des Offenbacher Vereins für Naturkunde. Offenbach a. M.  
1860— Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; R.S.i.; S.K.i.
- Ó-Gyalla Aspa. Obs. Beob. ....** Beobachtungen angestellt am Astrophysicalischen [und Meteorologischen] Observatorium in Ó-Gyalla in Ungarn. Halle, Budapest.  
1879— M.O.i.; R.A.S.; R.S.i.; S.K.i.
- Oken Isis ....** Isis, oder Encyclopädische Zeitung; Oken. Jena.  
1817—48. B.M.i.; Camb.U.; Edinb.U.; Glasg.U.; Linn.S.i.; N.H.M.; Oxon.B.(R.); R.C.Surg.i.; R.S.; S.K.i.

## List of Serial Publications

- Omodei A. Un.** ..... Annali Universali di Medicina; Omodei, Calderini. Milano.  
1817—88. B.M.i.; Glasg.P.S.i.; R.C.Surg.
- Oph. Eb.** ..... Ophthalmologische Bibliothek. Braunschweig.  
1802—05. Glasg.P.S.i.; R.C.Surg.i.
- Opusc. Mt. Fis.** ..... Opuscoli matematici e fisici di diversi Autori. Milano.  
1832—34. R.S.
- Orléans EIL.** ..... Bulletin des Sciences Physiques, Médicales et d'Agriculture  
d'Orléans. Orléans.  
1810—13. B.M.; Oxon.B.
- Ørsted Ts.** ..... Tidsskrift for Naturvidenskaberne; Ørsted. Kjøbenhavn.  
1822—28. B.M.; Camb.U.; N.H.M.; R.S.
- Orv.-Termt. Éta.** ..... Orvos-Természettudományi Értesítő a Kolozsvári Orvos-Természettu-  
dományi Társulat és az Erdélyi Muzeum-Egylet Természettu-  
dományi Szakosztályának..... [Medical and Natural History  
Proceedings of the Sections of the Klausenburg Medical and  
Natural History Society and of the Natural History Section of the  
Museum Association of Transylvania.] Kolozsvár [Klausenburg].  
1879— N.H.M.; R.S.i.
- Osnab. Jbr.** ..... Jahresbericht des Naturwissenschaftlichen Vereins zu Osnabrück.  
Osnabrück.  
1870— Edinb.R.S.i.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; R.S.
- Padova Ac. At. e Mem.** ... Atti e Memorie della R. Accademia di Scienze, Lettere ed Arti in  
Padova. Nuova serie. Padova.  
1835— [Continuation of: Nuovi Saggi dell'Accademia, etc. 1817—83.]  
Edinb.R.S.; Geol.S.i.; N.H.M.
- Padova Mem. Ac.** ..... Memorie dell' Accademia di Scienze, Lettere ed Arti di Padova.  
Padova.  
1809. B.M.; Camb.U.; N.H.M.; Oxon.B.; R.S.; S.K.
- Padova N. Sag.** ..... Nuovi Saggi dell' Accademia di Scienze, Lettere, ed Arti di Padova.  
Padova.  
1817—83. [Continued as: Atti e Memorie della R. Accademia, etc.  
1885—] B.M.i.; Camb.U.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.  
R.S.; N.H.M.; Oxon.B.i.; R.C.Surg.i.; R.S.i.; S.K.i.
- Padova Ev. Period.** ..... Rivista Periodica dei Lavori della I. R. Accademia di Scienze,  
Lettere ed Arti di Padova. Padova.  
1851—65. B.M.; Edinb.R.S.i.; Geol.S.; N.H.M.; R.S.
- Padova S. Sc. At.** ..... Atti della Società Veneto-Trentina di Scienze Naturali residente in  
Padova. Padova.  
1872— Glasg.P.S.i.; N.H.M.
- Padova S. Sc. EIL.** ..... Bullettino della Società Veneto-Trentina di Scienze Naturali.  
Padova.  
1879— B.M.; N.H.M.
- Palermo Ac. At.** ..... Atti dell' Accademia di Scienze, Lettere ed Arti di Palermo. Palermo.  
1845— B.M.; Camb.U.i.; Dub.R.I.A.; Dub.T.C.; Glasg.U.i.;  
N.H.M.; Oxon.B.i.; R.A.S.i.; R.C.Surg.i.; R.S.i.
- Palermo At.** ..... Rendiconti del Circolo Matematico di Palermo. Palermo.  
1887— B.M.i.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.;  
Math.S.; R.S.
- Palermo Effem.** ..... Effemeridi Scientifiche e Letterarie per la Sicilia; coi Lavori del  
R. Istituto d' Incoraggiamento per la Sicilia. Palermo.  
1832—40. Glasg.P.S.i.; N.H.M.
- Palermo G. I. Inc.** ..... Giornale del R. Istituto d' Incoraggiamento di Agricoltura, Arti, etc.  
in Sicilia. Parte 3. Scienze Fisico-Matematiche e Naturali.  
Palermo.  
1863. Glasg.P.S.i.
- Palermo G. Sc. Mt.** ..... Giornale di Scienze naturali ed economiche, pubblicato per cura del  
Consiglio di Perfezionamento annesso al R. Istituto Tecnico di  
Palermo. Palermo.  
1865— B.M.; Camb.U.; Dub.R.D.S.i.; Geol.S.i.; R.S.
- Palermo Mem. Spet. It.** ..... Memorie della Società degli Spettroscopisti Italiani, raccolte e  
pubblicate per cura del Prof. P. Tacchini. Palermo.  
1872— B.M.i.; Camb.U.; Edinb.R.S.i.; P.O.; R.A.S.; R.S.  
See Spet. It. Mem.
- Palomba Rac.** ..... Raccolta di Lettere, etc. intorno alla Fisica ed alle Mathematiche;  
Palomba. Roma.  
1845—48. B.M.i.

## List of Serial Publications

- Pander Btr. Ntk.** ..... Beiträge zur Naturkunde aus den Ostseeprovinzen Russlands; Pander. Dorpat.  
1820. Glasg.P.S.i.; N.H.M.; R.S.
- Par. A. Cons.** ..... Annales du Conservatoire des Arts et Métiers. Paris.  
1861— B.M.; Camb.U.; Glasg.P.S.i.; I.CE.i.; Oxon.B.; P.O.; R.S.; S.K.i.  
*See A. Cons. Arts et Mét.*
- Par. Ac. Sc. Mm.** ..... Mémoires de l'Académie des Sciences de l'Institut de France. Paris.  
1816— B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.D.S.i.; Dub.T.C.i.; Edinb.R.S.i.; Edinb.U.; Geol.S.i.; Glasg.U.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.A.S.i.; R.C.Surg.; R.S.; S.K.; U.C.L.  
*See Par. Mm. Ac. Sc.*
- Par. A. das Sc.** ..... Annaes das Sciencias, etc. por huma Sociedade de Portuguezes residentes em Paris. Paris.  
1818—27. B.M.; Camb.U.i.  
*See A. das Sc.*
- Par. A. Éc. Norm.** ..... Annales scientifiques de l'École Normale Supérieure. Paris.  
1864— B.M.; Camb.P.S.i.; Camb.U.; Dub.N.L.I.i.; Dub.R.C.S.i.; Dub.R.D.S.i.; Edinb.R.S.i.; Edinb.U.i.; Glasg.U.i.; Oxon.B.; R.S.; S.K.  
*See Par. Éc. Norm. A.*
- Par. A. Obs.** ..... Annales de l'Observatoire de Paris. Mémoires. Paris.  
1854— B.M.; Camb.U.; Dub.N.L.I.; Dub.T.C.; Edinb.R.S.; Glasg.U.i.; Oxon.B.; R.A.S.; R.S.  
*See Par. Obs. A.*
- Par. A. Fon. Chauss.** ..... Annales des Ponts et Chaussées. Mémoires et documents relatifs à l'Art des Constructions et au Service de l'Ingénieur. Paris.  
1831— B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.; P.O.; R.S.i.  
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- Par. Bul. S. St.** ..... Bulletin de la Société Botanique de France. Paris.  
1854— B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.i.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; Pharm.S.i.; S.K.  
*See Fr. S. St. Bul.*
- Par. Bul. S. C.** ..... Bulletin de la Société Chimique de Paris. Paris.  
1858— B.M.; Camb.U.i.; Chem.S.; Dub.N.L.I.i.; Dub.R.C.S.i.; Dub.R.D.S.i.; Edinb.U.i.; Glasg.U.i.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.; R.S.; S.K.  
*See Par. S. C. Bul.*
- Par. Bul. S. Encour.** ..... Bulletin de la Société d'Encouragement pour l'Industrie Nationale. Paris.  
1802— Camb.U.; Dub.R.C.S.i.; Dub.T.C.i.; Edinb.R.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Oxon.B.; P.O.; R.S.; S.K.i.
- Par. Bul. S. Gg.** ..... Bulletin de la Société de Géographie. Paris.  
1822— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.; U.C.L.i.  
*See Par. Gg. S. Bul. and Par. S. Gg. Bul.*
- Par. Bul. S. Phlm.** ..... Bulletin des Sciences de la Société Philomathique de Paris. Paris.  
1791—1805; 1814—24; 1864— B.M.i.; Camb.U.; Dub.T.C.i.; Edinb.R.S.i.; Glasg.U.i.; Math.S.i.; N.H.M.; Oxon.R.i.; P.O.i.; R.A.S.i.; R.C.Surg.i.; R.S.; U.C.L.  
*See Par. S. Phlm. Bul.*
- Par. Bur. Long. An.** ..... Annuaire publié par le Bureau des Longitudes. Paris.  
1799— B.M.; Camb.U.i.; Edinb.U.i.; Glasg.U.i.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.
- Par. Cl. Alp. Fr. An.** ..... Annuaire du Club Alpin Français. Paris.  
1875— B.M.; Geol.S.i.; R.Geogr.S.
- Par. Éc. Norm. A.** ..... *See Par. A. Éc. Norm.*
- Par. Éc. Pol. Cor.** ..... Correspondance sur l'École Polytechnique, à l'usage des Éléves de cette École; Hachette. Paris.  
1808—16. B.M.i.; Oxon.B.; R.S.; U.C.L.
- Par. Éc. Pol. J.** ..... Journal de l'École Polytechnique. Paris.  
1795— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; I.CE.i.; Linn.

## List of Serial Publications

- S.i.; Math.S.i.; Oxon.B.(R.); P.O.; R.A.S.i.; R.S.; S.K.; U.C.L.i.
- Par. J. Éc. Pol.** ..... See **Par. J. Éc. Pol.**
- Par. Gg. S. Bil.** ..... See **Par. Bil. S. Gg. and Par. S. Gg. Bil.**
- Par. Ing. Civ. Mm.** ..... Mémoires et Comptes Rendus des Travaux de la Société des Ingénieurs Civils. Paris.  
1848— B.M.; Glasg.U.i.; I.CE.; P.O.  
See **Par. Mm. Ing. Civ.**
- Par. J. Éc. Pol.** ..... See **Par. Éc. Pol. J.**
- Par. Lb. Hl. Tr.** ..... École Pratique des Hautes Études. Laboratoire d'Histologie du Collège de France. Travaux. Paris.  
1877— B.M.; Camb.U.; Oxon.R.; R.C.Surg.i.; R.S.; U.C.L.i.
- Parma G. S. Md. Chir.** ... Giornale della Società Medico-Chirurgica di Parma. Parma.  
1806—13. B.M.; Glasg.P.S.i.
- Par. Mm. Ac. Sc.** ..... See **Par. Ac. Sc. Mm.**
- Par. Mm. de l'I.** ..... Mémoires de la Classe des Sciences mathématiques et physiques de l'Institut. Paris.  
1798—1815. B.M.; Edinb.R.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; S.K.; U.C.L.
- Par. Mm. Ing. Civ.** ..... See **Par. Ing. Civ. Mm.**
- Par. Mm. Sav. Étr.** ..... Mémoires présentés à l'Institut des Sciences, Lettres et Arts par divers Savans, et lus dans ses Assemblées: Sciences Mathématiques et Physiques. Paris.  
1806—11. B.M.; Camb.U.; Dub.R.D.S.; Dub.T.C.; Edinb.R.S.; Glasg.U.; I.CE.; N.H.M.; Oxon.R.; P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Par. Mm. S. L.** ..... Mémoires présentés par divers Savans à l'Académie des Sciences de l'Institut de France. Paris.  
1827— B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Geol.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.A.S.i.; R.C.Surg.; R.S.; S.K.
- Par. Mm. S. Sav.** ..... Mémoires de la Société Linnéenne de Paris. Paris.  
1822—27. B.M.; Camb.U.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; Oxon.R.i.; R.S.i.
- Par. Mm. S. Sav.** ..... Mémoires des Sociétés Savantes et Littéraires de la République Française. Recueillis et rédigés par les Citoyens Prony, etc. Paris.  
1801—02. B.M.; Oxon.B.; R.S.
- Par. Ms. H. Nt. Bil.** ..... Bulletin du Muséum d'Histoire Naturelle. Paris.  
1895— B.M.; Camb.U.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.R.; R.S.; S.K.
- Par. Ms. H. Nt. Cent.** ... Centenaire de la Fondation du Muséum d'Histoire Naturelle. Paris.  
1893. B.M.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; N.H.M.; R.S.
- Par. Ms. H. Nt. Mm.** ... Mémoires du Muséum d'Histoire Naturelle. Paris.  
1815—32. B.M.; Camb.P.S.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Par. Ms. H. Nt. N. Arch.** Nouvelles Archives du Muséum d'Histoire Naturelle. Paris.  
1865— [Continuation of: Archives, etc., 1839—61.] B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.; R.S.; S.K.i.
- Par. Obs. A.** ..... } See **Par. A. Obs.**
- Par. Obs. A. (Mm.)** ..... }
- Par. Poids et Mes. FV.** ... Comité International des Poids et Mesures. Procès-Verbaux des Séances. Paris.  
1875— Camb.P.S.; Camb.U.i.; Dub.R.D.S.; Glasg.U.i.; M.O.i.; Oxon.R.; P.O.; R.A.S.; R.S.; S.K.i.
- Par. Poids et Mes. Tr. Mm.** Travaux et Mémoires du Bureau International des Poids et Mesures. Paris.  
1881— Camb.P.S.; Camb.U.; Chem.S.; Glasg.U.i.; I.CE.i.; Oxon.B.; Oxon.R.; R.A.S.; R.S.; S.K.; U.C.L.
- Par. S. Bl. Mm.** ..... Comptes Rendus des Séances et Mémoires de la Société de Biologie. Paris.  
1849— B.M.i.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.U.i.; Glasg.U.i.; N.H.M.; Oxon.R.; R.C.Surg.; R.S.i.; S.K.i.

## List of Serial Publications

- Par. S. BI. (Vol. Jubl.)...** Cinquantenaire de la Société de Biologie. Volume Jubilaire. Paris. 1899. Edinb.R.S.; R.C.Surg.; R.S.
- Par. S. C. BI.** ..... See **Par. BI. S. C.**
- Par. S. Chir. BI. et Mem.** Bulletins et Mémoires de la Société de Chirurgie de Paris. Paris. 1875— [Continuation of: Bulletins, 1851—74, and Mémoires, 1847—74.], Camb.U.; Glasg.P.S.i.; Oxon.B.(B.); R.C.Surg.
- Par. S4. Éc. Norm.** ..... Séances des Ecoles Normales. Paris. 1800—01. R.S.; U.C.L.
- Par. S4. S. Pa.** ..... Séances de la Société Française de Physique. Paris. 1873— B.M.i.; Camb.P.S.i.; Glasg.U.i.; P.O.; R.S.; S.K.  
See **Par. S. Pa. S4.**
- Par. S. Gg. BI.** ..... See **Par. BI. S. Gg. and Par. Gg. S. BI.**
- Par. S. Gg. C. R.** ..... Compte Rendu des Séances de la Société de Géographie et de la Commission Centrale. Paris. 1882— B.M.; Camb.U.; N.H.M.i.; Oxon.B.; R.Geogr.S.; B.S.i.; U.C.L.i.
- Par. S. Gl. BI.** ..... Bulletin de la Société Géologique de France. Paris. 1830— B.M.; Camb.U.i.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.; N.H.M.; Oxon.B.; Oxon.R.; R.S.; S.K.i.; U.C.L.i.
- Par. S. Md. Ém. Mem.** ... Mémoires de la Société Médicale d'Émulation. Paris. 1797—1826. B.M.i.; Camb.U.; Glasg.P.S.i.; Glasg.U.i.; Oxon.B.; R.C.Surg.
- Par. S. Mth. BI.** ..... Bulletin de la Société Mathématique de France. Paris. 1873— B.M.; Camb.P.S.; Camb.U.; Edinb.R.S.; Math.S.; Oxon.R.; R.A.S.; R.S.
- Par. S. Philm. BI.** ..... See **Par. BI. S. Philm.**
- Par. S. Philm. Mem. Cent.** Mémoires publiés par la Société Philomathique à l'occasion du Centenaire de sa Fondation. Paris. 1888. B.M.; Edinb.R.S.; N.H.M.; R.A.S.; R.S.
- Par. S. Philm. N. BI.** ..... Nouveau Bulletin des Sciences de la Société Philomathique de Paris. Paris. 1807—1813; 1825—26; 1832—33. B.M.i.; Camb.U.; Dub.T.C.; N.H.M.; P.O.i.; R.C.Surg.; R.S.; U.C.L.
- Par. S. Philm. FV.** ..... Extraits des Procès-Verbaux des Séances de la Société Philomathique. Paris. 1836—63. N.H.M.; R.S.  
See **Par. S4. S. Pa.**
- Par. S. Pa. S4.** ..... See **Par. S4. S. Pa.**
- Par. T. Nauk Śc. Pam.** ... Pamiętnik Towarzystwa Nauk Ścisłych w Paryżu. Paris. 1871—82. B.M.; N.H.M.
- Par. Tr. S. Amat.** ..... Notices des Travaux de la Société des Amateurs des Sciences physiques et naturelles de Paris. Paris. 1807—08.
- Perpignan Mem. S. Ag. Pyr. Orient.** ..... Société Agricole, Scientifique, et Littéraire des Pyrénées-Orientales. [Mémoires.] Perpignan. 1863. Glasg.P.S.i.
- Peterm. Mt.** ..... Mittheilungen aus Justus Perthes' Geographischer Anstalt über wichtige neue Erforschungen auf dem Gesamtgebiete der Geographie; Petermann. Gotha. 1855— B.M.; Camb.U.; Dub.R.C.S.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.; M.O.i.; N.H.M.i.; Oxon.B.; Oxon.R.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Pfaff Mt.** ..... Mittheilungen [Practische und kritische Mittheilungen] aus dem Gebiete der Medicin, Chirurgie, und Pharmacie; Pfaff. Kiel, Altona. 1832—41. Glasg.P.S.i.; R.C.Surg.; R.S.
- Pfäg. Arch. Fl.** ..... Archiv für die gesammte Physiologie des Menschen und der Thiere; Pfäfer. Bonn. 1868— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Edinb.U.; Glasg.U.i.; N.H.M.i.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Philad. Ac. Nt. Sc. J.** ... Journal of the Academy of Natural Sciences of Philadelphia. Philadelphia. 1817— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Edinb.U.i.; Geol.S.i.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.C.Surg.i.; R.S.i.; S.K.i.  
See **Philad. J. Ac. Nt. Sc.**

## List of Serial Publications

- Philad. Ac. Nt. Sc. F.** ... Proceedings of the Academy of Natural Sciences of Philadelphia. Philadelphia.  
1841— B.M.i.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.; Glasg.P.S.; Linn.S.i.; N.H.M.; Oxon.B.; P.O.i.; R.A.S.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- Philad. Coll. Phm. J.** ..... Journal of the Philadelphia College of Pharmacy. Philadelphia.  
1830—35. [Continued as: American Journal of Pharmacy, 1836—] Glasg.P.S.; Pharm.S.; R.C.Surg.  
*See Philad. J. Coll. Phm.*
- Philad. J. Ac. Nt. Sc.** ... *See Philad. Ac. Nt. Sc. J.*
- Philad. J. Coll. Phm.** ..... *See Philad. Coll. Phm. J.*
- Philad. Md. Pa. J.** ..... The Philadelphia Medical and Physical Journal. Philadelphia.  
1804—08. B.M.; Edinb.U.i.; Glasg.P.S.i.; N.H.M.; R.S.i.
- Philad. T.** ..... Transactions of the American Philosophical Society. Philadelphia.  
1771— B.M.i.; Camb.P.S.; Camb.U.i.; Chem.S.i.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; N.H.M.i.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.  
*See Am. Ph. S. T.*
- Phil. Trans.** ..... Philosophical Transactions of the Royal Society of London. London.  
1665— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.R.C.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; Linn.S.i.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
- Phm. CB.** ..... Pharmaceutisches Central-Blatt. Leipzig.  
1830—49. [Continued as: Chemisch-pharmaceutisches Central-Blatt, 1850—55.] B.M.; Chem.S.i.; Glasg.P.S.i.; Pharm.S.i.; P.O.; R.S.; U.C.L.i.
- Ph. Mag.** ..... The Philosophical Magazine, or Annals of Chemistry, Mathematics, Astronomy, Natural History and General Science. London.  
1827—32. [Continuation of: The Philosophical Magazine...; Tilloch, 1798—1826.]  
The London, Edinburgh [and Dublin] Philosophical Magazine and Journal of Science. London.  
1832— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.; Linn.S.i.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Phm. J.** ..... The Pharmaceutical Journal and Transactions. London.  
1841— B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Dub.T.C.i.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.B.(R.); Pharm.S.; R.C.Surg.; R.S.i.; S.K.i.; U.C.L.
- Phm. Z. Russl.** ..... Pharmaceutische Zeitschrift für Russland. St Petersburg.  
1862— B.M.; P.O.  
*See Russl. Phm. Z.*
- Phot. J.** ..... The Photographic Journal, including the Transactions of the Photographic Society of Great Britain. London.  
1877— [Continuation of: The Journal of the Photographic Society of London, 1854—76.] B.M.; Camb.U.i.; Chem.S.; Dub.T.C.i.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.; I.CE.i.; Oxon.B.; Pharm.S.i.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.i.
- Ph. Stud.** ..... Philosophische Studien herausgegeben von Wilhelm Wundt. Leipzig.  
1883— Camb.U.; Dub.T.C.; Edinb.U.; Glasg.U.; Oxon.B.; R.S.; U.C.L.
- Ph. Arch.** ..... Photographisches Archiv; Journal des allg. Deutschen Photographen-Vereins. Elberfeld.  
1860—97. B.M.; Glasg.P.S.i.; P.O.
- Ph. Mb.** ..... Photographische Monatshefte. Braunschweig.  
1862—64. B.M.; Glasg.P.S.i.
- Ph. S. J.** ..... Journal of the Photographic Society of London. London.  
1853—76. [Continued as: The Photographic Journal, 1877—] B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.i.; I.CE.i.; Oxon.B.; Pharm.S.; P.O.; R.A.S.; R.S.; S.K.

## List of Serial Publications

- Pisa A. Un. Tosc.** ..... (Annali delle Università Toscane. (Parte 2da.) Scienze Cosmologiche. Pisa.  
**Pisa A. Un. Tosc. Sc. Cosm.** ..... 1846— Camb.U.i.; N.H.M.; R.S.i.; S.K.i.  
**Pisa Misc. Md. Chir.** ... Miscellanea medico-chirurgico-farmaceutiche raccolte in Pisa. Pisa. 1843—44. Glasg.P.S.i.; Oxon.B.  
**Pisa N. G.** ..... Nuovo Giornale de' Letterati. Pisa. 1822—39. B.M.; Camb.U.; Oxon.B.  
**Pisa S. Tosc. At. (Mm.)**... Atti della Società Toscana di Scienze Naturali residente in Pisa. Memorie. Pisa. 1875— B.M.; Camb.P.S.i.; Dub.R.I.A.; Geol.S.; N.H.M.; R.S.  
**Pisa S. Tosc. At. (PV)**... Atti della Società Toscana di Scienze Naturali residente in Pisa. Processi Verbali. Pisa. 1875— B.M.; Camb.P.S.i.; Dub.T.C.; Geol.S.i.; N.H.M.; R.S.  
**Pistoja At. Ac.** ..... Atti della R. Accademia Pistoiese di Scienze, Lettere ed Arti: Memorie di Matematica e Fisica, per l' anno 1816. Pistoja. 1816. B.M.; Camb.U.; N.H.M.; Oxon.B.; R.S.  
**Plista. Ra.** ..... Le Physiologiste Russe. Moscou. 1898— Glasg.P.S.i.; R.S.; U.C.L.i.  
**Plym. I. T.** ..... Annual Reports and Transactions of the Plymouth Institution and Devon and Cornwall Natural History Society. Plymouth. 1855— Camb.U.i.; Dub.N.L.I.i.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.B.i.; R.S.; S.K.; U.C.L.i.  
**Pogg. A.** ..... Annalen der Physik und Chemie; Poggendorff, Wiedemann. Leipzig. 1824—99. [Continuation of: Annalen der Physik; Gilbert, 1799—1824.] [Continued as: Annalen der Physik; Drude, 1900—] B.M.; Camb.P.S.i.; Camb.U.; Chem.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.(R.); Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.  
**See A. Fa. C.**  
**Poligrafo** ..... Il Poligrafo: Giornale di Scienze, Lettere ed Arti; Orti. Verona. 1830—45. B.M.; Oxon.B.  
**Polli A.** ..... Annali di Chimica; Polli. Milano. 1845—97. [Continued as: Annali di Farmacoterapia e Chimica, 1898—] B.M.; Camb.U.i.; Chem.S.i.; Pharm.S.i.; P.O.i.  
**See A. di C.**  
**Pollich.** ..... Jahresbericht der Pollichia, eines Naturwissenschaftlichen Vereins der Rheinpfalz. Dürkheim a. d. Haardt. 1843— Camb.U.; Linn.S.; N.H.M.; R.S.i.  
**Pol. Mt.** ..... Polytechnische Mittheilungen, unter Mitwirkung von Professoren höherer technischer Lehranstalten. Tübingen. 1844—46. B.M.; R.S.  
**Pop. As.** ..... Popular Astronomy. Northfield, Minnesota. 1894— B.M.; Glasg.U.; B.A.S.; S.K.  
**Pop. Sc. Ev.** ..... The Popular Science Review: a Quarterly Miscellany of entertaining and instructive articles on Scientific Subjects; Samuelson. London. 1861—81. B.M.; Camb.U.; Dub.R.D.S.; Dub.T.C.; Edinb.U.i.; Geol.M.; Geol.S.i.; Glasg.U.i.; I.CE.; Linn.S.; N.H.M.; Oxon.B.; Oxon.B.i.; Pharm.S.i.; P.O.; R.C.Surg.; R.S.i.; S.K.  
**Portugal Trab. Gl. Com.** ..... Communicações da Comissão dos Trabalhos Geologicos de Portugal. Lisboa. 1883—92. [Continued as: Communicações da Direcção, etc., 1895—] B.M.; Camb.P.S.; Geol.M.; Geol.S.; Glasg.P.S.i.; N.H.M.; Oxon.R.i.; R.S.  
**Prace Mt-Fiz.** ..... Prace Matematyczno-Fizyczne. Warsaw. 1888— Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.i.; Math.S.; R.S.i.  
**Practit.** ..... The Practitioner. London, Paris, New York, Melbourne. 1868— B.M.; Camb.U.; Edinb.U.; Glasg.U.i.; Oxon.B.; Pharm.S.i.; R.C.Surg.  
**Prag Ab.** ..... Abhandlungen der k. Böhmischen Gesellschaft der Wissenschaften. Prag. 1785—1892. B.M.i.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.i.; R.S.i.; S.K.i.  
**See Böhm. Ges. Ab.**



## List of Serial Publications

- Frag Česká Ak. Fr. Jos. Pam.** ..... Památník na oslavu padesátiletého panovnického jubilea jeho veličenstva císaře a krále Františka Josefa I. Vydala Česká Akademie Císaře Františka Josefa pro Vědy, Slovesnost a Umění. [Memoirs in honour of the jubilee of his Imperial and Royal Majesty Franz Joseph I. Edited by the Imperial Bohemian Franz-Joseph Academy of Sciences, Literature and Art.] Praha (Prag).  
1898. Camb.P.S.; N.H.M.
- Frag Česká Ak. Fr. Jos. Rz.** ..... Rozprawy České Akademie Císaře Františka Josefa pro Vědy, Slovesnost a Umění. [Memoirs of the Imperial Bohemian Franz-Joseph Academy of Sciences, Literature and Art.] Prag.  
1891— B.M.; Edinb.R.S.; N.H.M.i.; U.C.L.i.
- Frag Fr. Jos. Ac. Sc. III. (Mth. Nt.)** ..... Académie des Sciences de l'Empereur François Joseph I (Česká Akademie Císaře Františka Josefa I). Bulletin International. Résumé des Travaux présentés. Sciences Mathématiques et Naturelles. Prag.  
1897— Edinb.R.S.; N.H.M.i.
- Frag Sb.** ..... Sitzungsberichte der k. Böhmischen Gesellschaft der Wissenschaften in Prag. Prag.  
1859— Camb.P.S.; Camb.U.i.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; R.S.; S.K.; U.C.L.i.
- Frag Vjechr.** ..... Vierteljahrschrift für die praktische Heilkunde; herausg. von der Medicinischen Facultät in Prag. Prag.  
1844—79. [Continued as: Zeitschrift für Heilkunde, 1880—] B.M.; Camb.U.i.; Glasg.P.S.i.; R.C.Surg.
- Fresburg Vh.** ..... Verhandlungen des Vereins für Naturkunde zu Presburg. Presburg.  
1856— B.M.; Camb.U.; Geol.S.i.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; R.S.i.
- Fresse Sc.** ..... Presse Scientifique des Deux Mondes. Paris.  
1860—66. B.M.; R.S.i.
- Fa. Medd.** ..... Physikaliske Meddelelser; Arndtsen. Christiania.  
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- Fa. Ev.** ..... The Physical Review. New York, London, Berlin.  
1894— B.M.; Camb.P.S.; Camb.U.; Dub.R.C.S.; Edinb.R.S.; Edinb.U.i.; Glasg.U.; Oxon.B.; P.O.; R.S.; S.K.
- Fa. Z.** ..... Physikalische Zeitschrift. Leipzig.  
1899— Camb.P.S.; Edinb.U.; Glasg.U.; Oxon.R.; P.O.; R.S.; S.K.; U.C.L.i.
- Fisd. Asps. Obs. Pb.** ..... Publicationen des Astrophysikalischen Observatoriums zu Potsdam. Potsdam.  
1878— B.M.; Camb.U.; Dub.R.D.S.; Oxon.R.; R.A.S.; R.S.
- Fulk. Obs. Pb.** ..... Publications de l'Observatoire Central Nicolas. St.-Petersbourg.  
1898— [Continuation of: Observations de Poulkova, 1869—91.] Camb.P.S.; Dub.R.I.A.; Edinb.R.S.i.; Glasg.P.S.i.; R.A.S.; R.S.i.
- QJ. Micr. Sc.** ..... Quarterly Journal of Microscopical Science; Lankester and Busk. London.  
1853— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Dub.R.C.S.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.  
*See J. Micr. Sc. and Micr. J.*
- QJ. Mth.** ..... The Quarterly Journal of Pure and Applied Mathematics. London.  
1855— B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.T.C.; Edinb.R.S.i.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; I.CE.i.; Math.S.i.; Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.S.; S.K.; U.C.L.
- QJ. Sc.** ..... The Journal of Science and the Arts; edited at the Royal Institution of Great Britain. London.  
1816—19.  
Quarterly Journal of Science, Literature and Arts. London.  
1819—30. B.M.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.R.S.; Glasg.U.i.; I.CE.; Oxon.B.; Oxon.R.; Pharm.S.; R.C.Surg.; R.S.; S.K.; U.C.L.
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1864—78. [Continued as: The Journal of Science, etc., 1879—85.] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Edinb.R.S.;

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- Edinb.U.; Glasg.U.; I.CE.i.; Linn.S.i.; M.O.i.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.
- Queensl. R. S. P.**..... The Proceedings of the Royal Society of Queensland. Brisbane. 1884— B.M.; Camb.P.S.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; P.O.t.; R.C.Surg.i.; R.Geogr.S.i.; R.S.
- Quek. Micr. Cl. J.** ..... Journal of the Quekett Microscopical Club. London. 1868— B.M.; Camb.U.; Dub.R.D.S.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.B.(R.); P.O.; R.S.; S.K.; U.C.L.
- Quetelet Cor. Mth.**..... Correspondance Mathématique et Physique; publiée par MM. Garnier et Quetelet. Gand, Bruxelles. 1825—39. B.M.; Camb.U.; R.A.S.i.; R.S.; U.C.L.
- Railroad & Eng. J.**..... The Railroad and Engineering Journal. New York. 1887—92. [*Continuation of*: Van Nostrand's Engineering Magazine, 1869—85.] [*Continued as*: American Engineer and Railroad Journal, 1893—] B.M.; I.CE.; P.O.
- Ranuzzi An. Gg.** ..... Annuario geografico Italiano; Ranuzzi. Bologna. 1844—45. B.M.; Camb.U.; R.Geogr.S.
- Rass. Sc. Gl. It.** ..... Rassegna delle Scienze Geologiche in Italia. Roma. 1892. B.M.i.; Camb.U.; Geol.M.i.; N.H.M.i.; B.S.i.; U.C.L.
- Rech. Chron.**..... Recherches Chronométriques; publiées sous la direction du Ministre de la Marine. Paris. 1854— R.S.i.
- Reclam Kosmos** ..... Kosmos: Zeitschrift für angewandte Naturwissenschaften; Reclam. Leipzig. 1857—60. B.M.; R.A.S.i.
- Rec. Mth. (Moscou)** ..... Recueil mathématique. Publié par la Société Mathématique de Moscou. [In Russian.] Moscou. 1866— R.S.
- Rec. Tr. C. F.-Bas** ..... Recueil des Travaux Chimiques des Pays-Bas [et de la Belgique]. Leide. 1892— Camb.P.S.; Chem.S.; P.O.; S.K.
- Reichert Arch.** ..... Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin; Müller, Reichert, Du Bois-Reymond. Berlin. 1834—76. [*Continuation of*: Archiv für Anatomie und Physiologie, 1826—32.] [*Continued as*: Archiv für Anatomie und Physiologie, 1877—] B.M.; Camb.U.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; N.H.M.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.  
*See Arch. An. Pl. and Müller Arch.*
- Reims A. Ac.** ..... Annales de l'Académie de Reims. Reims. 1842—43. [*Continued as*: Séances etc., 1844—] B.M.; Glasg.P.S.i.; N.H.M.; Oxon.B.; R.S.
- Reims Sé. Ac.** ..... Séances et Travaux de l'Académie de Reims. Reims. 1844— [*Continuation of*: Annales, etc., 1842—43.] B.M.i.; N.H.M.i.; Oxon.B.
- Rép. C. Appl.** ..... Répertoire de Chimie appliqué. Paris. 1859—63. Camb.U.; Chem.S.; Glasg.P.S.i.; N.H.M.; Pharm.S.i.; R.S.
- R. H. Pp.** ..... Papers on subjects connected with the duties of the Corps of Royal Engineers. London. 1843— Camb.U.; Geol.M.i.; I.CE.; P.O.i.; S.K.i.
- Rheinl. Westphal. Sh.** ... Sitzungsberichte der Niederrheinischen Gesellschaft für Natur- und Heilkunde zu Bonn. Bonn. 1854— B.M.i.; Camb.U.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.R.; R.S.i.; S.K.  
*See Bonn Niedr. Ga. Sh.*
- Rheinl. Westphal. Vh.** Verhandlungen des Naturhistorischen Vereins der Preussischen Rheinlande, Westfalens und des Reg.-Bezirks Osnabrück. Bonn. 1844— B.M.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.R.; R.C.Surg.i.; R.S.i.; S.K.  
*See Bonn NH. Vr. Vh. and Bonn Vh. NH. Vr.*
- Riga Arb. Nf. Vr.** ..... Arbeiten des Naturforschenden Vereins in Riga. Budolstadt. 1848. Camb. U.; Glasg.P.S.i.; N.H.M.; R.S.
- Riga Cor.-Bl.** ..... Correspondenzblatt des Naturforscher-Vereins zu Riga. Riga. 1846— B.M.; Dub.R.I.A.i.; N.H.M.; R.S.i.
- R. I. J.** ..... Journal of the Royal Institution of Great Britain. London.

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- 1802—08; 1880—81. Camb.U.i.; Chem.S.i.; Dub.R.D.S.; Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.i.; Oxon.R.; Pharm.S.i.; P.O.i.; R.A.S.i.; R.C.Surg.; R.S.; S.K.i.; U.C.L.i.
- Rio Obs. Ev.** ..... Revista do Observatorio. Publicação Mensal do Imperial Observatorio do Rio de Janeiro. Rio de Janeiro.
- 1886—91. Dub.R.D.S.i.; Edinb.R.S.i.; M.O.; R.A.S.; R.S.
- R. I. P.** ..... Notice of the Proceedings at the meetings of the members of the Royal Institution, with Abstracts of the Discourses delivered at the Evening Meetings. London.
- 1851— B.M.; Camb.U.; Chem.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; Linn.S.; M.O.; N.H.M.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Rm. At.** ..... Atti dell' Accademia Pontificia de' Nuovi Lincei. Roma.
- Rm. At. N. Linc.** ..... 1847— B.M.; Dub.R.I.A.; Edinb.R.S.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.i.; R.A.S.i.; R.Geogr.S.i.; R.S.  
See **Rm. N. Linc. At.**
- Rm. At. R. Ac.** ..... Atti della Reale Accademia dei Lincei. Roma.
- 1870—83. B.M.; Camb.P.S.; Camb.U.i.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Glasg.U.i.; Linn.S.; Math.S.i.; N.H.M.; Oxon.B.; Oxon.R.i.; R.A.S.i.; R.Geogr.S.; R.S.; S.K.i.; U.C.L.i.  
See **Rm. R. Ac. Linc. At.**
- Rm. Bil. Met.** ..... Bullettino Meteorologico dell' Osservatorio del Collegio Romano. Roma.
- 1862—78. [Continued as: Pontificia Università Gregoriana, 1879—] Edinb.R.S.i.; Glasg.P.S.i.; M.O.; R.A.S.; R.S.; U.C.L.i.
- Rm. Cor. Sc.** ..... Corrispondenza Scientifica in Roma per l'avanzamento delle Scienze, etc. Roma.
- 1848—69.  
See **Rm. Sc. Cor.**
- Rm. N. Linc. At.** ..... See **Rm. At.**
- Rm. N. Linc. Mm.** ..... Memorie della Pontificia Accademia dei Nuovi Lincei. Roma.
- 1887— Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; N.H.M.; R.S.
- Rm. R. Ac. Linc. At.** ..... See **Rm. At. R. Ac.**
- Rm. R. Ac. Linc. Mm.** ... Atti della R. Accademia dei Lincei. Memorie della Classe di Scienze fisiche, matematiche e naturali. Roma.
- 1877— B.M.i.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.i.; Linn.S.; Math.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.A.S.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Rm. R. Ac. Linc. Rd.** ..... Atti della R. Accademia dei Lincei. Rendiconti. Roma.
- 1885— [Continuation of: Transunti, 1877—94.] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.R.S.; Geol.S.; Glasg.U.; I.CE.i.; Linn.S.; Math.S.; N.H.M.; Oxon.B.; Oxon.R.; R.A.S.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Rm. R. Ac. Linc. T.** ..... Atti della R. Accademia dei Lincei. Transunti. Roma.
- 1877—84. [Continued as: Rendiconti, 1885—] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.i.; Linn.S.; Math.S.; N.H.M.; Oxon.B.; Oxon.R.; R.A.S.; R.Geogr.S.; R.S.; S.K.i.; U.C.L.
- Rm. Sc. Cor.** ..... See **Rm. Cor. Sc.**
- Rm. S. It. Mm.** ..... Memorie di Matematica e di Fisica della Società Italiana delle Scienze. Napoli, Roma.
- 1782— B.M.i.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Glasg.U.i.; Linn.S.i.; Oxon.B.i.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.i.; U.C.L.i.  
See **Mod. Mm. S., Mod. S. It. Mm., and Verona Mm. S. It.**
- Rm. Spec. Vat. Fb.** ..... Pubblicazioni della Specola Vaticana. Roma, Torino.
- 1891— Glasg.U.i.; M.O.; R.A.S.; R.S.
- Rm. Uff. Centr. Met. A.** ..... Annali dell' Ufficio Centrale di Meteorologia Italiana [Ufficio Centrale Meteorologico e Geodinamico Italiano]. Roma.
- 1880— M.O.; R.A.S.i.
- Rob. J. An.** ..... Journal de l'Anatomie et de la Physiologie normales et pathologiques de l'Homme et des Animaux; Robin. Paris.
- 1864— B.M.; Camb.P.S.i.; Camb.U.; Edinb.U.; Glasg.U.i.; N.H.M.i.; Oxon.B.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.i.

## List of Serial Publications

- Rochester (N. Y.) Ac.** Proceedings of the Rochester Academy of Sciences. Rochester, N.Y. 1890— B.M.; Camb.P.S.; Edinb.R.S.i.; Linn.S.; N.H.M.; R.S.; U.C.L.i.
- Roser u. Wunderlich Arch.** Archiv für Physiologische Heilkunde; Roser, Wunderlich, Griesinger. Stuttgart. 1842—59. [*Continued as:* Archiv der Heilkunde, 1860—78.] B.M.; Camb.U.; Glasg.P.S.i.; Oxon.R.i.; R.C.Surg.; R.S.; U.C.L.
- Rot. H. Vh.** Nieuwe Verhandelingen van het Bataafsche Genootschap der Proefondervindelijke Wijsbegeerte te Rotterdam. Rotterdam. 1800— B.M.i.; Camb.U.i.; Chem.S.i.; Dub.R.D.S.; Edinb.R.S.i.; Glasg.U.i.; I.CE.i.; Oxon.B.; R.C.Surg.i.; R.S.
- Rouen Ac. Tr.** Précis analytique des Travaux de l'Académie des Sciences, Belles-Lettres, et Arts de Rouen. Rouen. 1804— B.M.; Camb.U.; Dub.R.I.A.; Dub.T.C.; N.H.M.i.; Oxon.B.; R.S.i.  
*See Rouen Tr. Ac.*
- Rouen Bul. S. Ém.** Bulletins [des travaux] de la Société Libre d'Émulation de Rouen. Rouen. 1837— B.M.; Oxon.B.
- Rouen S. Sc. Bul.** Bulletin de la Société des Amis des Sciences Naturelles de Rouen. Rouen. 1875— B.M.; Glasg.P.S.i.; N.H.M.
- Rouen Tr. Ac.** *See Rouen Ac. Tr.*
- Roum. I. Mét. A.** Annales de l'Institut Météorologique de Roumanie. Bucarest, Paris. 1886— B.M.i.; Edinb.R.S.; M.O.; R.Geogr.S.i.; R.S.i.
- Rpm. Anal. C.** Repertorium der Analytischen Chemie für Handel, Gewerbe und Öffentliche Gesundheitspflege. Hamburg, Leipzig. 1881—87. [*Continued as:* Zeitschrift für die Chemische Industrie, 1887.] Chem.S.; P.O.
- Rpm. Mth.** Repertorium der literarischen Arbeiten aus dem Gebiete der reinen und angewandten Mathematik. Leipzig. 1877—79. Camb.U.; R.S.
- Rpm. Phm.** Repertorium für die Pharmacie; Gehlen. Nürnberg. 1815—51. B.M.; Camb.U.; Edinb.U.; Pharm.S.; R.O.Surg.; R.S.
- Rpm. Ph.** Repertorium der Physik. Enthaltend eine vollständige Zusammenstellung der neuern Fortschritte dieser Wissenschaft. Berlin. 1837—49. Chem.S.; Glasg.P.S.i.; P.O.; R.S.; S.K.; U.C.L.
- Ra. C. Pa. S. J.** Journal of the Russian Chemical Society and of the Physical Society of the Imperial University of St. Petersburg. [In Russian.] St. Petersburg. 1873—78. [*Continuation of:* Journal of the Russian Chemical Society, 1869—72.] [*Continued as:* Journal of the Russian Physico-Chemical Society, etc., 1879—] Camb.P.S.i.; Chem.S.; Edinb.R.S.i.; N.H.M.
- Ra. C. S. J.** Journal of the Russian Chemical Society. [In Russian.] St. Petersburg. 1869—72. [*Continued as:* Journal of the Russian Chemical Society and of the Physical Society of the Imperial University of St. Petersburg, 1873—78.] Camb.P.S.i.; Chem.S.; Edinb.R.S.i.; Glasg.P.S.i.; N.H.M.
- R. S. F.** Abstracts of the papers printed in the Philosophical Transactions of the Royal Society of London from 1800 to 1843. London. 1832—43.  
Abstracts of the papers communicated to the Royal Society of London from 1843 to 1854. London: 1851—54.  
Proceedings of the Royal Society of London. London. 1856— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.; Linn.S.i.; Math.S.i.; M.O.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Ra. Pa.-C. S. J.** Journal of the Russian Physico-Chemical Society of the Imperial University of St Petersburg. [In Russian.] St Petersburg. 1879— [*Continuation of:* Journal of the Russian Chemical Society, etc., 1869—78.] Camb.P.S.i.; Chem.S.; Edinb.R.S.i.; N.H.M.
- R. S. Yearbook** Yearbook of the Royal Society of London. (Biography 1900.)

## List of Serial Publications

- Rugby N.H. S. Sp.** ..... Reports of the Rugby School Natural History Society. Rugby.  
1867— Geol.S.i.; M.O.; N.H.M.; R.A.S.; S.K.i.
- Russl. Phm. Z.** ..... Pharmaceutische Zeitschrift für Russland. St. Petersburg.  
1862— B.M.; P.O.  
*See Phm. Z. Russl.*
- Rv. Artl.** ..... Revue d'Artillerie. Paris, Nancy.  
1872— B.M.; I.CE.; P.O.
- Rv. Brasil.** ..... Revista Brasileira, Jornal de Sciencias, Letras e Artes; Oliveira.  
Rio de Janeiro.  
1857—61. B.M.; N.H.M.; R.S.i.
- Rv. Bot.** ..... Revue de Botanique. Bulletin Mensuel de la Société Française de  
Botanique. Courrensan, Toulouse.  
1882—95. Glasg.P.S.i.; N.H.M.; Pharm.S.i.
- Rv. Cours Sc.** ..... Revue des Cours Scientifiques de la France et de l'Étranger; Eug.  
Yung et Em. Alglave. Paris.  
1863—70. [*Continued as:* Revue Scientifique, etc., 1871—] B.M.;  
Edinb.R.S.i.; Edinb.U.; N.H.M.; Oxon.B.; P.O.; R.C.Surg.;  
R.S.; S.K.
- Rv. Gén. Bot.** ..... Revue Générale de Botanique. Paris.  
1889— B.M.; Camb.U.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.;  
S.K.; U.C.L.
- Rv. Gg. It.** ..... Rivista Geografica Italiana. Roma.  
1893— B.M.; Glasg.P.S.i.; R.Geogr.S.
- Rv. It. Sc. Nt. Siena** ..... Rivista Italiana di Scienze Naturali. Siena.  
1889— [*Continuation of:* Bollettino del Naturalista, 1881—88.]  
Glasg.P.S.i.; N.H.M.
- Rv. Mar.** ..... Revue maritime et coloniale. Paris.  
1861— B.M.; I.CE.i.; M.O.i.; Oxon.B.; P.O.; R.Geogr.S.i.
- Rv. Mar. et Col.** ..... Rivista di Mineralogia e Cristallografia Italiana. Padova.  
1887— B.M.; Camb.U.; Geol.M.; Geol.S.; N.H.M.; S.K.
- Rv. Mn. Cr.** ..... Rivista di Matematica. Torino.  
1891—95. [*Continued as:* Revue de Mathématiques, 1896—]  
Camb.U.; Oxon.B.; R.S.
- Rv. Mth.** ..... Revue de Mathématiques. Turin.  
1896— [*Continuation of:* Rivista di Matematica, 1891—95.]  
Camb.U.; Oxon.B.; R.S.
- Rv. Quest. Sc.** ..... Revue des Questions Scientifiques, publiée par la Société Scientifique  
de Bruxelles. Louvain, Paris.  
1877— B.M.; N.H.M.; S.K.i.
- Rv. Sc.** ..... Revue scientifique et industrielle; Quesneville. Paris.  
1840—52. B.M.; Camb.U.; Chem.S.i.; Oxon.B.i.; S.K.
- Rv. Sc.** ..... La Revue Scientifique de la France et de l'Étranger. Paris.  
1871— [*Continuation of:* Revue des Cours Scientifiques, etc.,  
1863—70.] B.M.; Camb.U.; Edinb.R.S.; Edinb.U.; Geol.S.;  
N.H.M.; Oxon.B.; P.O.; R.A.S.i.; R.C.Surg.; R.S.; S.K.
- Rv. Sc.-Ind.** ..... Rivista Scientifico-Industriale delle principali scoperte ed invenzioni  
fatte nelle scienze e nelle industrie. Firenze.  
1869— P.O.
- Rv. Sper. Freniatr.** ..... Rivista Sperimentale di Freniatria e di Medicina legale. Reggio-  
Emilia.  
1875— R.C.Surg.
- Rv. Trim. Microgr.** ..... Revista Trimestral Micrográfica. Organó del Laboratorio Histológico  
de la Facultad de Medicina de Madrid. Madrid.  
1896— R.S.
- Rv. Un. Mines** ..... Revue Universelle des Mines, de la Métallurgie, etc.; de Cuyper.  
Paris, Liège.  
1857— B.M.; Camb.U.; Dub.B.I.A.i.; Glasg.P.S.i.; Glasg.U.i.;  
I.CE.i.; N.H.M.; P.O.; S.K.  
*See Cuyper Rv. Un.*
- S. Afr. C. Mtl. S. J.** ..... The Journal of the Chemical and Metallurgical Society of South  
Africa. Johannesburg.  
1898— Camb.P.S.; Chem.S.; Glasg.P.S.i.; P.O.; S.K.i.
- S. Afr. C. Mtl. S. F.** ..... The Proceedings of the Chemical and Metallurgical Society of South  
Africa. Johannesburg, Edinburgh, New York.  
1894— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Glasg.P.S.i.; P.O.;  
S.K.

## List of Serial Publications

- S. Afr. Ph. S. T.** ..... The Transactions of the South African Philosophical Society. Cape Town.  
1878— B.M.; Camb.P.S.; Camb.U.i.; Chem.S.; Edinb.R.S.; Edinb.U.; Glasg.P.S.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.
- S. Afr. QJ.** ..... The South African Quarterly Journal; edited at the African Institution. Cape Town.  
1830—35. B.M.i.; Edinb.R.S.i.; N.H.M.; R.Geogr.S.i.
- Santiago de Chile Un. A.** ..... Anales de la Universidad de Chile. Santiago de Chile.  
1843— B.M.i.; Dub.T.C.; Glasg.U.i.; N.H.M.i.; Oxon.B.i.; R.Geogr.S.i.
- Sarthe S. Bul.** ..... Bulletin de la Société d'Agriculture, etc., de la Sarthe. Le Mans.  
1833— R.S.i.
- S. Aust. R. S. T.** ..... Transactions and Proceedings and Report of the Royal Society of South Australia. Adelaide.  
1879— Camb.P.S.i.; Camb.U.i.; Chem.S.i.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.; I.CE.i.; Linn.S.i.; N.H.M.; P.O.; R.A.S.; R.C.Surg.i.; R.Geogr.S.i.; R.S.i.
- Sav. Ac. Mm.** ..... Mémoires de la Société Académique de Savoie. Chambéry.  
**Sav. Mm. Ac.** ..... { 1825— Camb.U.; Dub.R.I.A.; Dub.T.C.; N.H.M.; Oxon.B.; R.S.i.  
{ See *Chambéry Mm. Ac. Sav.*
- Sav. S. H. Mt. Bul.** ..... Bulletin de la Société d'Histoire Naturelle de Savoie. Chambéry.  
1850—53; 1887— Geol.S.i.; N.H.M.
- Sc. Abs.** ..... Science Abstracts. Physics and Electrical Engineering. London.  
1898— Camb.P.S.; Camb.U.; Chem.S.; Edinb.R.S.i.; Edinb.U.; Glasg.P.S.; I.CE.; Oxon.B.; P.O.; R.A.S.i.; R.S.; S.K.; U.C.L.
- Sc. Gg. Mag.** ..... The Scottish Geographical Magazine. Edinburgh.  
1885— B.M.; Camb.U.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.i.; M.O.; N.H.M.; Oxon.B.; R.Geogr.S.; U.C.L.
- Schelling W. K. Spec. Ph.** ..... Neue Zeitschrift für speculative Physik; Schelling. Tübingen.  
1802. [*Continuation of: Zeitschrift, 1800—01.*] B.M.; Glasg.P.S.i.; R.S.
- Schelling K. Spec. Ph. ...** ..... Zeitschrift für speculative Physik; Schelling. Jena, Leipzig.  
1800—01. [*Continued as: Neue Zeitschrift, 1802.*] B.M.; Camb.U.; Oxon.B.; R.S.
- Scherer J. C.** ..... Allgemeines Journal der Chemie; Scherer. Leipzig.  
1798—1802. [*Continued as: Neues Allgemeines Journal etc., 1803—06.*] B.M.; Glasg.P.S.i.; N.H.M.; R.S.
- Sch. Ga. N. D.** ..... Neue Denkschriften der allgemeinen Schweizerischen Gesellschaft für die gesammten Naturwissenschaften. Neuchâtel, Zürich, etc.  
1837— B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.B.; R.C.Surg.i.; R.S.; S.K.  
*See Zür. N. D. Sch. Ga.*
- Sch. Ga. Vh.** ..... Verhandlungen der Schweizerischen Gesellschaft für die gesammten Naturwissenschaften. Aarau, etc.  
1823— B.M.i.; Edinb.R.S.i.; Geol.S.i.; Glasg.U.i.; Linn.S.i.; N.H.M.; R.C.Surg.i.; R.S.; S.K.  
*See Act. S. Helv., At. S. Elvet. and Sch. Nf. Ga. Vh.*
- Schl.-Holst. Nt. Vr. Schr.** ..... Schriften des Naturwissenschaftlichen Vereins für Schleswig-Holstein. Kiel.  
1873— B.M.; Camb.U.; Edinb.R.S.i.; Linn.S.; N.H.M.; R.S.i.
- Schlömilch K.** ..... Zeitschrift für Mathematik und Physik; Schlömilch. Leipzig.  
1856— B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.U.; Glasg.U.i.; Math.S.i.; Oxon.B.(R.); R.S.; S.K.; U.C.L.i.  
*See Z. Mth. Ph.*
- Sch. Mines Q. N. Y.** ..... The School of Mines Quarterly. New York.  
1879— B.M.i.; Glasg.P.S.; I.CE.i.; N.H.M.; P.O.; S.K.i.  
*See Act. S. Helv., At. S. Elvet. and Sch. Ga. Vh.*
- Sch. Nf. Ga. Vh.** ..... Schweizerische polytechnische Zeitschrift; Bolley. Winterthur.  
1856—70. B.M.; I.CE.; P.O.; R.Geogr.S.i.
- Schröder B. Zeev.** ..... Berigten en Verhandelingen over eenige onderwerpen des Zeevaarts; Schröder. Amsterdam.  
1823—25. B.M.; Glasg.P.S.i.

## List of Serial Publications

- Schumacher An. Ab.** ..... Astronomische Abhandlungen; Schumacher. Altona.  
1823—25. B.M.; Camb.U.; Dub.R.D.S.; Edinb.R.S.; R.A.S.; R.S.
- Schumacher Jb.** ..... Jahrbuch (astronomisches); Schumacher. Stuttgart, Tübingen.  
1836—44. Camb.U.; Edinb.R.S.i.; Oxon.R.i.; R.A.S.; R.S.i.;  
U.C.L.
- Schwäb. Ga. D.** ..... Denkschriften der Schwäbischen Gesellschaft der Aerzte und  
Naturforscher. Tübingen.  
1805. N.H.M.; R.S.; S.K.
- Schweigger J.** ..... Journal für Chemie und Physik; Schweigger. Nürnberg.  
1811—33. B.M.; Chem.S.i.; Edinb.R.S.; N.H.M.; Oxon.R.; P.O.;  
R.C.Surg.; R.S.i.; S.K.
- Science** ..... Science. Cambridge, Mass., and New York.  
1883— B.M.; Camb.P.S.i.; Dub.N.L.I.i.; Dub.R.C.S.i.; Edinb.  
R.S.; Edinb.U.i.; Geol.S.i.; Glasg.P.S.i.; I.CE.i.; N.H.M.;  
Oxon.R.i.; P.O.; R.A.S.i.; R.Geogr.S.; S.K.
- S. C. Ind. J.** ..... The Journal of the Society of Chemical Industry. Manchester,  
London.  
1892— Camb.U.; Chem.S.; Dub.N.L.I.; Dub.R.C.S.; Dub.R.D.S.;  
Edinb.R.S.i.; Edinb.U.i.; Geol.M.i.; Glasg.U.i.; I.CE.; Oxon.R.i.;  
Pharm.S.; P.O.; R.S.; S.K.; U.C.L.
- Sc. Micr. S. F. & T.** ..... Proceedings and Transactions of the Scottish Microscopical Society.  
Edinburgh.  
1839— Camb.P.S.; Dub.R.D.S.; Edinb.U.; Glasg.P.S.i.; Linn.S.;  
R.S.i.
- Sc. Met. S. J.** ..... Journal of the Scottish Meteorological Society. Edinburgh,  
London.  
1864— B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.; Edinb.U.i.;  
Glasg.P.S.; Glasg.U.i.; M.O.; Oxon.B.; Oxon.R.i.; R.Geogr.S.i.;  
R.S.i.; S.K.i.
- Sc. S. Arts T.** ..... Transactions of the Royal Scottish Society of Arts. Edinburgh.  
1841— B.M.i.; Camb.U.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.;  
Glasg.P.S.; Glasg.U.; I.CE.; P.O.; R.S.; S.K.  
*See Edinb. Sc. S. Arts P. and Edinb. T. Sc. S. Arts.*
- S. Dyers Col. J.** ..... The Journal of the Society of Dyers and Colourists. Bradford, Yorks.  
1884— Chem.S.i.; Glasg.P.S.i.; P.O.; S.K.
- Seine-et-Oise Mem.** ..... Mémoires de la Société des Sciences Naturelles de Seine et Oise.  
Versailles.  
1835— B.M.; Camb.U.i.; N.H.M.; S.K.
- Seism. J. Jap.** ..... Seismological Journal of Japan. Yokohama.  
1892—95. [*Continuation of:* Transactions of the Seismological  
Society of Japan, 1890—92.] B.M.; Camb.U.i.; Dub.R.I.A.;  
Geol.M.; Geol.S.; I.CE.; R.A.S.i.; R.Geogr.S.; R.S.
- Senckb. N.Z. Ga. B.** ..... Bericht über die Senckenbergische Naturforschende Gesellschaft  
in Frankfurt am Main. Frankfurt a. M.  
1868— B.M.; Camb.U.i.; Geol.S.i.; Linn.S.; N.H.M.; Oxon.R.;  
R.C.Surg.i.; R.S.
- S. Fernando Obs. Mar. A.** ..... Anales del Instituto y Observatorio de Marina de San Fernando.  
San Fernando.  
1883— Camb.P.S.i.; M.O.; R.A.S.; R.S.i.
- Sid. Mess.** ..... The Sidereal Messenger. Northfield, Minn.  
1883—91. [*Continued as:* Astronomy and Astrophysics, 1892—94.]  
B.M.; R.A.S.; S.K.i.
- Siena At. Ac.** ..... Atti dell' Accademia delle Scienze di Siena detta de' Fisiso-critici.  
Siena.  
1761— B.M.; Camb.U.i.; Dub.R.I.A.i.; Dub.T.C.i.; N.H.M.i.;  
Oxon.B.; R.C.Surg.i.; R.S.i.
- Silliman J.** ..... The American Journal of Science and Arts; Silliman. New Haven.  
1818— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.N.L.I.i.;  
Dub.R.C.S.i.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Geol.M.;  
Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.;  
Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.  
*See Am. J. Sc.*
- Sk. N.L. F.** ..... Förhandlingar vid det af Skandinaviska Naturforskare och Läkare  
**Sk. Nt. Möt. F.** ..... hållna Môte..... Götheborg, etc.  
**Sk. Nt. Möt. F.** ..... Forhandlingerne ved de Skandinaviske Naturforskeres...Møde....  
Götheborg, etc.  
1839— B.M.; N.H.M.; Oxon.B.i.; R.C.Surg.i.; R.S.i.

## List of Serial Publications

- Smiths. Ct.** ..... Smithsonian Contributions to Knowledge. Washington.  
1848— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.  
R.S.; Edinb.U.; Geol.M.i.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.;  
I.CE.; Linn.S.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.i.;  
R.A.S.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
- Smiths. I. Asps. Obs. A.** Annals of the Astrophysical Observatory of the Smithsonian Institu-  
tion. Washington.  
1900— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Edinb.R.S.;  
Glasg.P.S.i.; I.CE.; M.O.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.
- Smiths. Misc. Col.** ..... Smithsonian Miscellaneous Collections. Washington.  
1862— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.  
R.S.; Edinb.U.; Geol.M.; Geol.S.i.; Glasg.P.S.; Glasg.U.;  
I.CE.; Linn.S.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.i.;  
R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Smiths. Rp.** ..... Annual Report of the Board of Regents of the Smithsonian Insti-  
tution. Washington.  
1848— B.M.i.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.i.;  
Geol.M.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.i.; Math.S.i.;  
M.O.i.; N.H.M.i.; Oxon.B.; Oxon.R.i.; Pharm.S.i.; P.O.i.;  
R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.i.; S.K.i.; U.C.L.i.
- Som. S. F.** ..... Somersetshire Archaeological and Natural History Society's Pro-  
ceedings. Taunton.  
1849— B.M.; Camb.U.; Dub.R.I.A.; Geol.S.i.; Glasg.P.S.i.;  
Linn.S.i.; N.H.M.; Oxon.B.i.; R.S.i.; S.K.i.; U.C.L.i.
- Sperim.** ..... Lo Sperimentale. Giornale critico di Medicina e Chirurgia. Firenze.  
1858—79.  
Lo Sperimentale. Giornale Italiano di Scienze Mediche. Firenze,  
Siena.  
1879— Edinb.U.i.; R.C.Surg.; R.S.i.
- Spet. It. Mem.** ..... Memorie della Società degli Spettroscopisti Italiani, raccolte e  
pubblicate per cura del Prof. P. Tacchini. Palermo.  
1872— B.M.i.; Camb.U.; Edinb.R.S.i.; P.O.; R.A.S.; R.S.  
See *Palermo Mem. Spet. It.*
- Spongia Cm. Md.** ..... Commentarii di Medicina; Spongia. Padova.  
1836—37. Glasg.P.S.i.
- Steierm. Ggn. Mont.  
Vr. B.** ..... Bericht des Geognostisch-Montanistischen Vereines für Steiermark.  
Gratz.  
1852—63. Geol.S.i.; Glasg.P.S.i.; N.H.M.; R.S.; S.K.
- Steierm. Mt.** ..... Mittheilungen des Naturwissenschaftlichen Vereines für Steiermark.  
Gratz.  
1863— B.M.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.;  
Linn.S.i.; M.O.i.; N.H.M.; R.S.; U.C.L.i.  
See *Gratz Mt. NW. Vr. Steierm.*
- St. Ét. Ind. S. In. Mn.** ... } Bulletin de la Société de l'Industrie minière. St. Étienne.  
**St. Ét. S. In. Mn. Ind.** ... } 1855— I.CE.; P.O.i.; S.K.i.
- Stett. Ztg.** ..... Entomologische Zeitung; herausg. v. d. Entomologischen Vereine  
zu Stettin. Stettin.  
1840—B.M.; Camb.U.; Linn.S.; N.H.M.
- St. Gal. B.** ..... Bericht über die Thätigkeit der St. Gallischen Naturwissenschaft-  
lichen Gesellschaft. St. Gallen.  
1860— N.H.M.; R.S.i.
- St. Louis Ac. T.** ..... The Transactions of the Academy of Science of St. Louis. St. Louis.  
**St. Louis T. Ac.** ..... } 1856— B.M.; Dub.R.I.A.; Edinb.R.S.; Geol.S.i.; Glasg.P.S.;  
Linn.S.i.; N.H.M.; Oxon.B.; P.O.i.; R.Geogr.S.; R.S.; S.K.
- Stockh. Ac. Hndl.** ..... Kongliga Svenska Vetenskaps-Akademiens Handlingar. Stockholm.  
**Stockh. Ak. Hndl.** ..... } 1739— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;  
Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.i.;  
N.H.M.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.
- Stockh. Ak. Hndl. Bh.** ... } Bihang till Kongl. Svenska Vetenskaps-Akademiens Handlingar.  
**Stockh. Bh. Ak. Hndl.** ... } Stockholm.  
1872— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.;  
Edinb.R.S.; Geol.S.; Glasg.P.S.; Linn.S.; N.H.M.; R.A.S.;  
R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Stockh. Gl. För. F.** ..... Geologiska Föreningens i Stockholm Förhandlingar. Stockholm.  
1872— B.M.; Geol.M.; Geol.S.; U.C.L.i.
- Stockh. Öfv.** ..... Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar. Stock-  
holm.



## List of Serial Publications

- 1844— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;  
Edinb.R.S.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.i.;  
N.H.M.; Oxon.R.; R.A.S.; R.Geogr.S.; R.S.; U.C.L.i.
- Stockh. Vt. Ak. Lefn.** ... Lefnadsteckningar öfver Kongl. Svenska Vetenskaps Akademien...  
ledamöter. Stockholm.
- 1869— Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; Glasg.P.S.;  
Linn.S.i.; R.A.S.; R.Geogr.S.; R.S.
- St. Pét. Ac. Mm.** ..... Mémoires de l'Académie Impériale des Sciences de St. Pétersbourg.  
St. Pétersbourg.
- 1803— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.;  
Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.i.;  
Geol.S.i.; Glasg.U.i.; Linn.S.i.; M.O.i.; N.H.M.; Oxon.B.;  
Oxon.R.; P.O.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.i.;  
U.C.L.i.
- See St. Pét. Ac. Sc. Mm. and St. Pét. Mm.*
- St. Pét. Ac. Sc. Bll.**..... Bulletin Scientifique publié par l'Académie Impériale des Sciences  
de St. Pétersbourg. St. Pétersbourg.  
1836—42.  
Bulletin de la Classe Physico-mathématique de l'Académie Impériale  
des Sciences de St. Pétersbourg. St. Pétersbourg, Leipzig.  
1843—59.  
Bulletin de l'Académie des Sciences de St. Pétersbourg. St. Péters-  
bourg.
- 1860— B.M.i.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;  
Edinb.R.S.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.; Linn.S.i.; N.H.M.;  
Oxon.B.; Oxon.R.i.; P.O.i.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.;  
R.S.; S.K.
- See St. Pét. Bll. Ac. Sc.*
- St. Pét. Ac. Sc. Mm.** ..... *See St. Pét. Ac. Mm. and St. Pét. Mm.*
- St. Pét. Ac. Sc. Mm. (Rs.)** Memoirs of the Imperial Academy of Science. [In Russian.]  
St. Petersburg. [Not the same as **St. Pét. Ac. Mm.**]  
1862—94. B.M.; Dub.R.I.A.
- St. Pét. Ac. Sc. N. Acta**... Nova Acta Academiae Scientiarum Imperialis Petropolitanae. Petropoli.  
1783—1802. B.M.; Camb.U.; Edinb.R.S.; Linn.S.i.; N.H.M.;  
Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; R.S.; U.C.L.
- St. Pét. Bll. Ac. Sc.** ..... } *See St. Pét. Ac. Sc. Bll.*
- St. Pét. Bll. Sc.** ..... }
- St. Pét. Com. Gl. Bll.** ... Bulletins du Comité Géologique. St. Pétersbourg.  
1883— Dub.R.I.A.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.i.;  
R.S.; S.K.i.; U.C.L.
- St. Pét. Md. Wschr.** ..... St. Petersburg Medicinische Wochenschrift. St. Petersburg.  
1876— B.M.; Camb.U.i.; Glasg.P.S.i.; R.C.Surg.
- St. Pét. Mm.** ..... } *See St. Pét. Ac. Mm. and St. Pét. Ac. Sc. Mm.*
- St. Pét. Mm. Ac. Sc.** ..... }
- St. Pét. Mm. Sav. Étr.** ... Mémoires présentés à l'Académie Impériale des Sciences de St. Péters-  
bourg par divers Savans. St. Pétersbourg.  
1831—59. B.M.; Camb.U.; Edinb.R.S.; Glasg.U.; Linn.S.;  
N.H.M.; R.A.S.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- St. Pét. Mn. Gs. Vh.**..... Verhandlungen der Russisch-Kaiserlichen Mineralogischen Gesell-  
schaft zu St. Petersburg. St. Petersburg.  
1842— B.M.; Camb.U.i.; Dub.T.C.; Edinb.R.S.i.; Geol.M.i.;  
Geol.S.; N.H.M.; R.Geogr.S.i.; R.S.i.; U.C.L.i.
- St. Quent. A.** ..... Annales Agricoles du département de l'Aisne, publiées par la Société  
des Sciences, Arts, Belles-Lettres et Agriculture de St. Quentin.  
St. Quentin.  
1831—42.  
Annales Scientifiques, Agricoles et Industrielles du département de  
l'Aisne (Société Académique de Saint Quentin). St. Quentin.  
1844—55? B.M.; Oxon.B.i.; R.S.i.
- St. Quent. Mm.** ..... Mémoires de la Société des Sciences, Arts, Belles-Lettres et Agriculture  
de la ville de St. Quentin. St. Quentin.  
1831— B.M.; R.S.i.
- Strasb. J. S. Sc.** ..... Journal de la Société des Sciences, Agriculture et Arts, du départe-  
ment du Bas-Rhin. Strasbourg.  
1824—28. [Continuation of: Mémoires, etc., 1811—23.] B.M.;  
Camb.U.; N.H.M.; Oxon.B.; R.S.  
*See Strasb. S. Sc. J.*

## List of Serial Publications

- Strasb. Mém. S. H. Nt.** ... { Mémoires de la Société des Sciences Naturelles de Strasbourg.  
Strasbourg.
- Strasb. Mém. S. Sc.** ..... { 1830—70. B.M.; Camb.U.; Dub.R.I.A.i.; Dub.T.C.i.; Geol.S.i.;  
Strasb. S. H. Nt. Mém. ... { N.H.M.; R.S.; S.K.i.
- Strasb. S. Sc. Bul.** ..... Bulletin de la Société des Sciences Naturelles de Strasbourg.  
Strasbourg.  
1868—70. B.M.; Geol.S.; N.H.M.i.
- Strasb. S. Sc. J.** ..... See **Strasb. J. S. Sc.**
- Strasb. S. Sc. Mém.** ..... Mémoires de la Société des Sciences, Agriculture et Arts de  
Strasbourg. Strasbourg.  
1811—23. [*Continued as:* Journal, etc., 1824—28.] Camb.U.;  
N.H.M.; Oxon.B.
- St. Sp. Ag. It.** ..... Le Stazioni Sperimentali Agrarie Italiane. Torino, Roma, Firenze,  
Asti, Modena.  
1872— B.M.i.; Chem.S.i.; R.S.i.
- St. Thom. Hosp. Rp.** ..... St. Thomas's Hospital Reports. London.  
1836; 1870— Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.;  
Oxon.B.; Oxon.R.; R.C.Surg.; R.S.i.; U.C.L.i.
- Stud.** ..... The Student and Intellectual Observer of Science, Literature, and  
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1868—71. [*Continuation of:* The Intellectual Observer, 1862—68.]  
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- S. W. I. E. P.** ..... Proceedings and Transactions of the South Wales Institute of  
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- Thomson A. Ph.** ..... Annals of Philosophy; or, Magazine of Chemistry, Mineralogy, Mechanics, Natural History, Agriculture, and the Arts; Thomson. London. 1813—26. [Continued in: The Philosophical Magazine, 1827—] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Edinb.R.S.i.; Geol.S.; Glasg.U.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Thomson Re.** ..... Records of General Science; R. D. and Thos. Thomson. London. 1835—36. B.M.; Camb.U.; Glasg.P.S.i.; Glasg.U.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; U.C.L.i. ...
- Tilloch Ph. Mag.** ..... The Philosophical Magazine, comprehending the various branches of Science, the Liberal and Fine Arts, Geology, Agriculture, Manufactures, and Commerce. London. 1798—1826. [Continued as: The Philosophical Magazine, or Annals of Chemistry, etc., 1827—] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Edinb.R.S.i.; Edinb.U.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Tim.** ..... Timehri: the Journal of the Royal Agricultural and Commercial Society of British Guiana. Demerara. 1882— B.M.; Camb.U.i.; Geol.S.i.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.i.; Pharm.S.i.; R.Geogr.S.; R.S.i.
- Tindal Vh. Zeewezzen** ... Verhandelingen en Berigten betrekkelijk het Zeewezzen en de Zeewartkunde; Tindal en Swart. Amsterdam. 1852—70. B.M.; P.O.; R.Geogr.S.i.; R.S.i.
- Tōk. Coll. Sc. J.** ..... The Journal of the College of Science, Imperial University, Japan. Tōkiō, Japan. 1887— [Continuation of: Memoirs of the Science Department, University of Tokio, Japan, 1879—85.] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.R.S.; Edinb.U.i.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; Math.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Tōk. Gl. S. Gl. Mag.** ..... The Geological Magazine. Geological Society of Tōkyō. Tōkyō. 1894—98. [Continued as: The Journal of the Geological Society of Tōkyō, 1898—] Geol.M.i.; N.H.M.
- Tōk. Gl. S. J.** ..... The Journal of the Geological Society of Tōkyō. Tōkyō. 1898— [Continuation of: The Geological Magazine, 1894—98.] Glasg.P.S.i.; N.H.M.
- Tōk. Un. Mem.** ..... Memoirs of the Science Department, University of Tokio, Japan. Tokio, Japan. 1877—85. [Continued as: The Journal of the College of Science, Imperial University, Japan, 1887—] Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- Tor. Ac. Mem.** ..... Memorie della R. Accademia delle Scienze di Torino. Torino. 1818— [Continuation of: Mémoires de l'Académie Royale des Sciences de Turin, 1784—1816.] B.M.i.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.i.
- Tor. Ac. Sc. At.** ..... *See Tor. Ac. Sc. Mem. and Tor. Mem. Ac.*  
Atti della R. Accademia delle Scienze di Torino. Torino. 1865— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; P.O.i.; R.A.S.; R.S.; S.K.; U.C.L.i.  
*See Tor. At. Ac. Sc.*

[In the references to this serial two sets of paging are sometimes given; the first refers to the volumes containing the Classe di Scienze Fisiche, Matematiche e Naturali only, the second to the

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- volumes containing all the sections. When only one paging is given, it refers to the fuller series.]
- Tor. Ac. Sc. Mem.** ..... See **Tor. Ac. Mem. and Tor. Mem. Ac.**
- Tor. At. Ac. Sc.** ..... See **Tor. Ac. Sc. At.**
- Tor. Lav. Sc. Fis. Mt.** ... Notizia storica dei lavori fatti dalla Classe di Scienze Fisiche e Matematiche della R. Accademia delle Scienze. Torino. 1864—65. [Continued as: Atti della R. Accademia, etc., 1865—] Geol.S.; Linn.S.; R.A.S.; R.S.
- Tor. Mem. Ac.** ..... See **Tor. Ac. Mem. and Tor. Ac. Sc. Mem.**
- Tortolini A.** ..... Annali di Scienze Matematiche e Fisiche; Tortolini. Roma. 1850—57.  
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- Toul. Ac. Sc. Ell.** ..... Bulletin de l'Académie des Sciences, Inscriptions et Belles-Lettres de Toulouse. Toulouse. 1898—99. Dub.R.I.A.; Edinb.R.S.; N.H.M.; R.S.
- Toul. Ac. Sc. Mem.** ..... Mémoires de l'Académie des Sciences, Inscriptions et Belles-Lettres de Toulouse. Toulouse. 1782— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; N.H.M.; Oxon.B.i.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.i.  
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- Toul. Fac. Sc. A.** ..... Annales de la Faculté des Sciences de Toulouse pour les Sciences Mathématiques et les Sciences Physiques. Paris. 1887— Camb.P.S.; Camb.U.; Edinb.R.S.; Math.S.; Oxon.R.; R.S.
- Toul. Mem. Ac.** ..... } See **Toul. Ac. Sc. Mem.**
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- Toul. S. E. Mt. Ell.** ..... Bulletin de la Société d'Histoire Naturelle de Toulouse. Toulouse. 1867— Geol.S.i.; N.H.M.
- Toul. S. Sc. Ell.** ..... Bulletin de la Société des Sciences Physiques et Naturelles de Toulouse. Toulouse. 1872— B.M.; Glasg.P.S.i.; N.H.M.
- Trieste Ell.** ..... Bollettino della Società Adriatica di Scienze Naturali in Trieste. Trieste. 1875— N.H.M.; R.S.
- Trommsdorff J. Phm.** ... Journal der Pharmacie für Aerzte und Apotheker. Leipzig. 1794—1816. [Continued as: Neues Journal, etc., 1817—33.] B.M.; Dub.T.C.i.; R.C.Surg.; R.S.
- Trommsdorff W. J. Phm.** ... Neues Journal der Pharmacie für Aerzte, Apotheker, und Chemisten; Trommsdorff. Leipzig. 1817—33. [Continuation of: Journal, etc., 1794—1816.] R.C.Surg.; R.S.
- Ts. Mt. Fys.** ..... Tidsskrift för Matematik och Fysik, tillägnad den Svenska Elementar-Undervisingen. Upsala. 1868—74. B.M.; R.S.i.
- Ts. Mth.** ..... Tidsskrift for Mathematik. Kjøbenhavn. 1865—89. [Continuation of: Mathematisk Tidsskrift, 1859—64.] [Continued as: Nyt Tidsskrift for Mathematik, 1890—] B.M.; Camb.U.; Math.S.i.; Oxon.B.; S.K.i.
- Ts. Ph. C.** ..... Tidsskrift for Fysik og Chemi samt disse Videnskabers Avendelse. Kjøbenhavn. 1862—94. [Continued as: Nyt Tidsskrift for Fysik og Chemi, 1896—98.] B.M.; N.H.M.
- Tübingen Ell.** ..... Tübinger Blätter für Naturwissenschaften und Arzneykunde. Tübingen. 1815—17. B.M.; Glasg.P.S.i.; R.C.Surg.; R.S.; U.C.L.i.
- Turin Ac. Mem.** ..... } Mémoires de l'Académie Royale des Sciences de Turin. Turin.
- Turin Mem. Ac.** ..... } 1784—1816. [Continued as: Memorie della R. Accademia delle Scienze di Torino, 1818—] B.M.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.U.i.; Linn.S.; Oxon.B.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.
- Ung. NW. Vr. Jb.** ..... Abhandlungen aus dem dritten Bande der Jahrbücher des Ungarischen Naturwissenschaftlichen Vereins zu Pest, in Deutscher Uebersetzung red. von J. Szabó. Pest. 1858. B.M.; Glasg.P.S.i.

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- Ups. Årsk.** ..... Upsala Universitetets Årsskrift. Upsala.  
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1865— B.M.i.; Pharm.S.i.; R.C.Surg.i.
- Ups. N. Acta S. Sc.** ..... Nova Acta Regis Societatis Scientiarum Upsaliensis. Upsalis.  
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Linn.S.; Math.S.i.; N.H.M.; Oxon.B.i.; Oxon.R.; R.A.S.i.;  
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- [U.S.] Chief Sig. Off. A. Ep.** ..... Annual Report of the Chief Signal Officer [of the Army] to the Secretary of War. Washington.  
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- U.S. Dpt. Ag. Yearb.** ... Yearbook of the United States Department of Agriculture. Washington.  
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- U. S. Fish Com. Rp.** ..... United States Commission of Fish and Fisheries. Report of the Commissioner. Washington.  
1873— B.M.i.; Camb.P.S.i.; Edinb.R.S.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.S.; S.K.
- U. S. Gl. Sv. Bul.** ..... Bulletin of the United States Geological Survey. Washington.  
1893— Camb.P.S.; Chem.S.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.i.; Geol.M.; Geol.S.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.i.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.
- U. S. Gl. Sv. Rp.** ..... Annual Report of the United States Geological Survey to the Secretary of the Interior. Washington.  
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- U. S. Mly. Weath. Ev.** ... United States of America: Department of Agriculture. Monthly Weather Review and Annual Summary. Washington, D.C.  
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- U.S. Sec. Ag. Rp.** ..... Report of the Secretary of Agriculture. Washington.  
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- U. S. Sig. Serv. Pp.** ..... United States of America: War Department. Professional Papers of the Signal Service. Washington.  
1881— B.M.i.; Dub.R.I.A.; Edinb.B.S.; Glasg.P.S.i.; M.O.; R.A.S.i.; R.S.

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- U.S. Weath. Bur. Bul.** ... U.S. Department of Agriculture. Weather Bureau. Bulletin. Washington.  
1892— Dub.R.I.A.; Edinb.R.S.i.; I.CE.i.; M.O.; Oxon.R.i.; P.O.i.; R.Geogr.S.i.; R.S.i.
- U.S. Weath. Bur. Ep.** ... U.S. Department of Agriculture. Weather Bureau. Report of the Chief of the Weather Bureau. Washington.  
1891— [Continuation of: Annual Report of the Chief Signal Officer, 1871—90.] Dub.R.I.A.; Edinb.R.S.; Glasg.U.i.; I.CE.; M.O.; Oxon.R.i.; R.Geogr.S.; R.S.
- Utr. A. Ac.** ..... Annales Academiæ Rheno-Trajectinæ. Trajecti ad Rhenum (Utrecht).  
1815—37. B.M.; Camb.U.i.; Glasg.U.i.; N.H.M.; Oxon.B.; Oxon.R.i.; R.C.Surg.; R.S.i.; S.K.i.
- Utr. Aant. Prv. Gn.** ..... Aanteekeningen van het Verhandelde in de Sectie-Vergaderingen van het Provinciaal Utrechtsch Genootschap van Kunsten en Wetenschappen. Utrecht.  
1846— Dub.R.D.S.; Edinb.R.S.; R.S.  
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- Utr. Oz.** ..... [Scheikundige] Onderzoekingen, gedaan in het [Physiologisch] Laboratorium der Utrechtsche Hoogeschool. Rotterdam, Utrecht.  
**Utr. Scheik. Oz.** ..... }  
1842—56; 1867— Glasg.P.S.i.; R.S.i.
- Utr. Prv. Gn. Aant.** ..... *See Utr. Aant. Prv. Gn.*
- Valenciennes Mm.** ..... { Mémoires de la Société d'Agriculture, des Sciences et des Arts de l'arrondissement de Valenciennes. Valenciennes.  
**Valenciennes Mm. S. Ag.** ..... }  
1838—53. B.M.; Oxon.B.i.; R.S.i.
- Vars. S. Nt. Tr. (C. R., Bl.)** ..... Travaux de la Société des Naturalistes de Varsovie. Comptes Rendus de la Section biologique. [In Russian.] Varsovie.  
1869— Glasg.P.S.i.; N.H.M.
- Vars. S. Nt. Tr. (C. R., Ps. C.)** ..... Travaux de la Société des Naturalistes de Varsovie. Comptes Rendus de la Section de physique et de chimie. Varsovie. [In Russian.]  
1869— Math.S.; N.H.M.
- Vars. S. Nt. Tr. (Mm.)** ..... Travaux de la Société des Naturalistes de Varsovie. Mémoires. [In Russian.] Varsovie.  
1891—96. Math.S.; N.H.M.
- Vauc. Ac. Mm.** ..... Mémoires de l'Académie de Vaucluse. Avignon.  
1882— N.H.M.
- V. Diem. R. S. Sp.** ..... Papers and Proceedings of the Royal Society of Van Diemen's Land. Hobart Town.  
1851—59. B.M.i.; Camb.P.S.i.; Dub.R.D.S.; Edinb.R.S.i.; Geol.S.; I.CE.i.; N.H.M.i.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.
- Ven. At.** ..... Atti delle Adunanze dell' I. R. Istituto Veneto di Scienze, Lettere ed Arti. Venezia.  
1841— B.M.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; I.CE.i.; Linn.S.i.; Math.S.i.; N.H.M.; R.S.i.  
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- Ven. At. Aten.** ..... Atti dell' Ateneo Veneto. Venezia.  
1864—77. [Continuation of: Esercitazioni Scientifiche e Letterarie dell' Ateneo di Venezia, 1837—60.] [Continued as: L' Ateneo Veneto, 1878—] Dub.R.D.S.; R.S.
- Ven. Aten.** ..... L' Ateneo Veneto: Rivista mensile di Scienze, Lettere ed Arti. Venezia.  
1878— [Continuation of: Atti dell' Ateneo Veneto, 1864—77.] Dub.R.D.S.i.; R.S.i.
- Ven. Aten. Esercit.** ..... Esercitazioni Scientifiche e Letterarie dell' Ateneo di Venezia. Venezia.  
**Ven. Esercit. Aten.** ..... }  
1837—60. [Continued as: Atti dell' Ateneo Veneto, 1864—77.] B.M.i.; Dub.T.C.i.; Oxon.B.i.; R.S.i.
- Ven. I. At.** ..... *See Ven. At.*
- Ven. I. Mm.** ..... Memorie del Reale Istituto Veneto di Scienze, Lettere ed Arti. Venezia.  
**Ven. Mm. I.** ..... }  
1843— B.M.; Camb.U.; Dub.R.I.A.i.; Linn.S.i.; N.H.M.; Oxon.B.i.; R.C.Surg.i.; R.S.; S.K.
- Verona Mm. Ac. Ag.** ... Memorie dell' Accademia d'Agricoltura, etc., di Verona. Verona.  
1807— B.M.i.; Glasg.P.S.i.; Oxon.B.i.

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- Verona Mem. S. It.** ..... { *Memorie di Matematica e di Fisica della Società Italiana delle Scienze.* Modena, Verona.  
1782— B.M.i.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Glasg.U.i.; Linn.S.i.; Oxon.B.i.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.i.; U.C.L.i.  
*See Mod. Mem. S., Mod. S. It. Mem. and Em. S. It. Mem.*
- Verona S. It. Mem.** ..... {
- Vict. I. J.** ..... Journal of the Transactions of the Victoria Institute, or Philosophical Society of Great Britain. London.  
1867— B.M.; Camb.U.; Dub.R.D.S.; Dub.T.C.; Geol.M.i.; Geol.S.; N.H.M.; Oxon.B.; P.O.; R.Geogr.S.i.; R.S.i.; S.K.
- Vict. R. S. P.** ..... Proceedings of the Royal Society of Victoria. Melbourne.  
1889— [*Continuation of:* Transactions and Proceedings, etc., 1861—88.] B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Vict. R. S. T.** ..... Transactions and Proceedings of the Royal Society of Victoria. Melbourne.  
1861—88. [*Divided into:* Transactions, 1888—, and Proceedings, 1889—] B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.  
*See Vict. T. R. S.*
- Vict. T. Ph. S.** ..... Transactions of the Philosophical Society of Victoria. Melbourne.  
1855. [*Continued as:* Transactions of the Philosophical Institute, etc., 1855—60.] B.M.; Edinb.R.S.; Geol.S.; Linn.S.; N.H.M.; R.A.S.; R.Geogr.S.; R.S.; S.K.
- Vict. T. R. S.** ..... *See Vict. R. S. T.*
- Virch. Arch.** ..... Archiv für Pathologische Anatomie und Physiologie und für Klinische Medicin; Virchow und Reinhardt. Berlin.  
1847— B.M.; Camb.U.; Chem.S.i.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; Oxon.R.; R.C.Surg.; R.S.; U.C.L.
- V. Mons J. C.** ..... Journal de Chimie, pour servir de complément aux Annales de Chimie et autres ouvrages périodiques français de cette science; Van Mons. Bruxelles.  
1792—1804. Glasg.P.S.i.; R.S.i.
- V. Nostr. Eng. Mg.** ..... Van Nostrand's Engineering Magazine. New York.  
1869—85. [*Continued as:* The Railroad and Engineering Journal, 1887—92.] B.M.; I.CE.i.; P.O.; R.S.i.
- Voigt Mg.** ..... Magazin für den neuesten Zustand der Naturkunden, mit Rücksicht auf die dazu gehörigen Hilfswissenschaften; Voigt. Jena, Weimar.  
1797—1806. B.M.; Camb.U.; N.H.M.; R.S.
- Walker Electr. Mg.** ..... The Electrical Magazine; Walker. London, Paris.  
1845—46. B.M.; Camb.U.; Glasg.P.S.i.; I.CE.; Oxon.B.; P.O.; R.S.
- Wash. As. Pp. for Ephem. & Naut. Alm.** ..... Astronomical Papers prepared for the use of the American Ephemeris and Nautical Almanac. Washington.  
1882— B.M.; Dub.R.I.A.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.i.; Oxon.R.; R.A.S.; R.S.
- Washburn Obs. Pp.** ..... Publications of the Washburn Observatory of the University of Wisconsin. Madison.  
1882— Camb.P.S.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.; Glasg.U.i.; R.A.S.; R.S.
- Wash. Mem. Nat. Ac.** ... { *Memoirs of the National Academy of Sciences.* Washington.  
1866— B.M.i.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.; Glasg.U.i.; Math.S.i.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.; R.S.; S.K.; U.C.L.i.
- Wash. Nat. Ac. Mem.** ..... {
- Wash. Ph. S. Bull.** ..... Bulletin of the Philosophical Society of Washington... Washington.  
1874— B.M.; Camb.P.S.; Edinb.R.S.; Geol.S.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; P.O.; R.A.S.; R.S.; S.K.i.
- Weale Q. Pp.** ..... Quarterly Papers on Engineering; Weale. London.  
1843—49. B.M.; I.CE.; Oxon.B.; P.O.
- W. Eng. J.** ..... The West of England Journal of Science and Literature. Bristol.

## List of Serial Publications

- 1835—36. B.M.; Camb.U.; Edinb.R.S.; I.CE.; N.H.M.; Oxon.B.; P.O.; S.K.
- Westf. Vr. Jbr.** ..... Jahres-Bericht des Westfälischen Provinzialvereins für Wissenschaft und Kunst. Münster.  
1879— N.H.M.
- Wet. Ga. A.** ..... Annalen der Wetterausischen Gesellschaft für die gesammte Naturkunde. Hanau, Frankfurt-am-Main.  
1809—12. [*Continued as*: Neue Annalen, etc., 1819.] B.M.; Camb.U.; Glasg.P.S.i.; N.H.M.; R.C.Surg.; R.S.
- Wet. Ga. Jbr.** ..... Bericht der Wetterausischen Gesellschaft für die gesammte Naturkunde zu Hanau. Hanau.  
1843— Dub.R.I.A.i.; Geol.S.i.; R.S.i.  
*See Wet. Ga. Mt. B.*
- Wet. Ga. N. A.** ..... Neue Annalen der Wetterausischen Gesellschaft für die gesammte Naturkunde. Hanau, Frankfurt-am-Main.  
1819. [*Continuation of*: Annalen, etc., 1809—12.] B.M.; Camb.U.; Glasg.P.S.i.; N.H.M.; R.C.Surg.; R.S.
- Wet. Ga. Mt. B.** ..... *See Wet. Ga. Jbr.*
- Wetter** ..... Das Wetter. Meteorologische Monatsschrift für Gebildete aller Stände. Magdeburg, Braunschweig, Berlin.  
1885— B.M.; M.O.
- Wlad. Mt.** ..... Wiadomości Matematyczne. Warsaw.  
1897— Camb.P.S.; Math.S.
- Wien Ak. D.** ..... Denkschriften der Kaiserlichen Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Classe. Wien.  
1850— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.M.i.; Geol.S.; Glasg.U.i.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.(R); P.O.i.; R.A.S.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.  
*See Wien D.*
- Wien Ak. Sb.** ..... Sitzungsberichte der Mathematisch-Naturwissenschaftlichen Classe der Kaiserlichen Akademie der Wissenschaften. Wien.  
1848— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.i.; Geol.S.; Glasg.U.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.i.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.  
*See Wien SB.*
- Wien Alm.** ..... Almanach der Kaiserlichen Akademie der Wissenschaften. Wien.  
1851— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.i.; Glasg.U.i.; Oxon.B.; P.O.i.; R.A.S.i.; R.S.i.; S.K.i.; U.C.L.i.
- Wien An.** ..... Anzeiger der Kaiserlichen Akademie der Wissenschaften: Math.-Naturwiss. Classe. Wien.  
1864— Camb.U.; Geol.S.i.; Linn.S.; N.H.M.; Oxon.B.; Pharm.S.i.; R.S.i.
- Wien Berg-Hm. Jb.** ..... Berg- und Hüttenmännisches Jahrbuch der k. k. Schemnitzer-Bergakademie und der k. k. Montan-Lehranstalten zu Leoben und Příbram. Wien.  
1851— B.M.i.; Geol.S.i.; I.CE.i.; P.O.i.; S.K.  
*See Berg-Hm. Jb., Jb Berg-Hm., and Leoben Berg-Hm. Jb.*
- Wien D.** ..... *See Wien Ak. D.*
- Wien Gg. Ga. Mt.** ..... Mittheilungen der k. k. Geographischen Gesellschaft. Wien.  
1857— B.M.; Dub.R.I.A.i.; Dub.T.C.i.; M.O.i.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.; S.K.i.  
*See Wien Mt. Gg. Ga.*
- Wien Gl. Jb.** ..... Jahrbuch der k. k. Geologischen Reichsanstalt. Wien.  
**Wien Jb. Gl.** ..... 1850— Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.M.; Geol.S.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.i.; R.S.; U.C.L.i.
- Wien Jb. Pol. I.** ..... Jahrbuch des k. k. Polytechnischen Instituts in Wien; Prechtl. Wien.  
1819—39. B.M.; Camb.U.; Oxon.B.; P.O.
- Wien Jbr. Ober-Realsch. Inn. Stadt.** ..... Jahresbericht der öffentlichen Ober-Realschule in der innere Stadt. Wien.  
1859—63.
- Wien. Md. Wschr.** ..... Wiener Medizinische Wochenschrift. Wien.  
1851— B.M.; Camb.U.i.; R.C.Surg.i.
- Wien Met. Z.** ..... Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie. Wien.



## List of Serial Publications

- 1866—85. [*Continued in: Meteorologische Zeitschrift, 1866—*]  
Camb.U.; Dub.R.D.S.; Edinb.R.S.; M.O.; P.O.; R.Geogr.S.; R.S.  
*See Wien Z. Met.*
- Wien Mt. Gg. Ga.** ..... *See Wien Gg. Ga. Mt.*
- Wien Fht. Cox.** ..... Photographische Correspondenz. Organ der Photograph. Gesellsch.  
in Wien. Wien.  
1865— P.O.
- Wien SB.** ..... } *See Wien Ak. Sb.*
- Wien Sb.** ..... }
- Wien Schr.** ..... } Schriften des Vereins zur Verbreitung Naturwissenschaftlicher
- Wien Schr. Vr.Nw.Kennt.** ..... } Kenntnisse in Wien. Wien.
- Wien Vr.Nw.Kennt.Schr.** ..... } 1860— B.M.i.; Camb.U.i.; N.H.M.i.; P.O.; R.S.i.
- Wien Z. Ga. Aerzte** ..... } Zeitschrift der K. K. Gesellschaft der Aerzte zu Wien. Wien.  
1844—60. [*Continued as: Medizinische Jahrbücher, 1861—*]  
Glasg.P.S.i.; R.C.Surg.
- Wien Z. Met.** ..... *See Wien Met Z.*
- Wild Epm. Met.** ..... Repertorium für Meteorologie, herausg. von der kaiserlichen Akad.  
der Wissenschaften; Wild. St. Petersburg.  
1870—84. B.M.; Camb.P.S.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.i.;  
I.CE.i.; M.O.; R.S.
- Wisc. Ac. T.** ..... Transactions of the Wisconsin Academy of Sciences, Arts and  
Letters. Madison.  
1872— B.M.; Camb.P.S.; Dub.R.I.A.; Edinb.R.S.; Geol.S.i.;  
N.H.M.; Oxon.R.i.; P.O.i.; R.S.; S.K.i.; U.C.L.i.
- Wisc. Un. Bul. (Sc.)** ..... Bulletin of the University of Wisconsin. Science Series. Madison.  
1894— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Glasg.P.S.i.;  
P.O.
- Woolh. FC. T.** ..... Transactions of the Woolhope Naturalists' Field Club. Hereford.  
1866— B.M.; Camb.U.i.; Dub.T.C.i.; Geol.M.i.; Geol.S.i.; Linn.  
S.i.; N.H.M.i.; Oxon.B.; U.C.L.i.
- Woolw. F.** ..... Minutes of Proceedings of the Royal Artillery Institution. Woolwich.  
1858— B.M.; Camb.U.i.; I.CE.; P.O.; R.Geogr.S.i.
- Würtb. Jh.** ..... Jahreshefte des Vereins für vaterländische Naturkunde in Württem-  
berg. Stuttgart.  
1845— B.M.; Camb.U.; Dub.R.D.S.i.; Dub.T.C.i.; Geol.S.;  
Linn.S.; N.H.M.; R.S.; S.K.
- Würtb. St. I. Arb.** ..... Arbeiten des Botanischen Instituts in Würzburg. Leipzig.  
1871—88. B.M.; Camb.U.; Glasg.P.S.i.; Linn.S.; N.H.M.;  
Oxon.R.; R.C.Surg.; R.S.
- Würtb. Jb. Ph. Md. Ga.** ..... Jahrbücher der Philosophisch-Medicinischen Gesellschaft zu Würz-  
burg. Würzburg.  
1828. Dub.R.I.A.; R.S.; U.C.L.
- Würtb. Nw. Z.** ..... Würzburger Naturwissenschaftliche Zeitschrift; herausgegeben von  
der Physikalisch-Medicinischen Gesellschaft. Würzburg.  
1860—67. [*Continuation of: Verhandlungen der Physikalisch-  
Medicinischen Gesellschaft, 1850—60.*] Camb.U.; Geol.S.i.;  
Linn.S.; N.H.M.; Oxon.R.; S.K.
- Würtb. Pa. Md. Sb.** ..... Sitzungsberichte der Physikalisch-Medicinischen Gesellschaft zu  
Würzburg. Würzburg.  
1859—62; 1881— Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;  
Linn.S.i.; Oxon.R.i.; R.C.Surg.i.; R.S.
- Würtb. Pa. Md. Vh.** ..... Verhandlungen der Physikalisch-Medicinischen Gesellschaft. Würz-  
burg.
- Würtb. Vh.** ..... } 1850—60. 1868— [*Continued as: Würzburger Medicinische Zeit-  
schrift, and Würzburger Naturwissenschaftliche Zeitschrift,  
1860—67.*] B.M.i.; Camb.P.S.i.; Camb.U.i.; Chem.S.i.; Dub.  
R.I.A.; Linn.S.; N.H.M.; Oxon.R.; R.C.Surg.; R.S.; S.K.i.;  
U.C.L.i.
- W. Yorks. Gl. S. F.** ..... Proceedings of the Geological and Polytechnic Society of the West  
Riding of Yorkshire. Leeds.
- W. Yorks. P. Gl. S.** ..... } 1839— B.M.i.; Camb.U.i.; Dub.R.D.S.; Edinb.R.S.i.; Geol.M.;  
Geol.S.i.; N.H.M.i.; Oxon.R.; P.O.i.; R.S.i.; U.C.L.i.  
*See Yorks. Gl. S. F.*
- Yn Lioar Manninagh** ... Yn Lioar Manninagh. The Journal of the Isle of Man Natural  
History and Antiquarian Society. Douglas.  
1894— Geol.M.; Geol.S.i.; N.H.M.

## List of Serial Publications

- Yorke. Gl. S. F.** ..... See **W. Yorke. Gl. S. F.**
- Zach. Cor.** ..... Correspondance Astronomique, Géographique, Hydrographique et Statistique; von Zach. Gènes.  
1818—26. B.M.; R.A.S.; R.S.
- Zach. M. Cor.** ..... Monatliche Correspondenz zur Beförderung der Erd- und Himmelskunde; von Zach. Gotha.  
1800—13. Oxon.B.; R.A.S.; R.S.; U.C.L.
- Z. Al. Erdk.** ..... Zeitschrift für allgemeine Erdkunde. Berlin.  
1853—65. [Continued as: Zeitschrift der Gesellschaft für Erdkunde zu Berlin, 1866—] B.M.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.; S.K.
- Z. Angew. C.** ..... Zeitschrift für Angewandte Chemie. Berlin.  
1888— [Continuation of: Zeitschrift für die Chemische Industrie, 1887.] B.M.; Chem.S.; Edinb.U.; Glasg.P.S.; Glasg.U.; Oxon.R.i.; P.O.
- Z. Angew. Mikr.** ..... Zeitschrift für Angewandte Mikroskopie. Berlin, Leipzig, Weimar.  
1896— Glasg.P.S.i.; N.H.M.; P.O.
- Z. Anorg. C.** ..... Zeitschrift für Anorganische Chemie. Hamburg, Leipzig.  
1892— Camb.P.S.; Camb.U.; Chem.S.; Dub.R.C.S.; Edinb.U.; Glasg.U.; N.H.M.; Oxon.R.i.; Pharm.S.; P.O.; S.K.; U.C.L.
- Zantedeschi A. Fis.** ..... Annali di Fisica; Zantedeschi. Padova.  
1849—50. B.M.; Glasg.P.S.i.; R.S.
- Z. Ax.** ..... Zoologischer Anzeiger; Carus. Leipzig.  
1878— B.M.; Camb.U.; Edinb.R.S.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; Linn.S.i.; N.H.M.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Z. Bauw.** ..... Zeitschrift für Bauwesen; herausg. unter Mitwirkung der königl. technischen Bau-Deputation und des Architekten-Vereins zu Berlin. Berlin.  
1851— B.M.; Camb.U.i.; I.CE.; P.O.; S.K.i.
- Z. Berg- H.-Salw.** ..... Zeitschrift für das Berg-, Hutten-, und Salinenwesen in dem Preussischen Staate. Berlin.  
1854— B.M.; I.CE.; P.O.; S.K.
- Z. Bl.** ..... Zeitschrift für Biologie. München.  
1865— B.M.; Camb.U.i.; Chem.S.i.; Edinb.U.i.; Glasg.U.i.; Oxon.R.; R.C.Surg.; R.S.; U.C.L.
- Z. C.** ..... Zeitschrift für Chemie. Leipzig.  
1865—71. [Continuation of: Zeitschrift für Chemie und Pharmacie, 1860—64.] B.M.; Camb.U.; Chem.S.; Dub.R.D.S.; Glasg.P.S.i.; N.H.M.; Oxon.R.i.; P.O.; R.S.i.; S.K.
- Z. C. In.** ..... Zeitschrift für die Chemische Industrie. Berlin.  
1887. [Continuation of: Repertorium der Analytischen Chemie, 1881—87.] [Continued as: Zeitschrift für Angewandte Chemie, 1888—] B.M.; Chem.S.; Glasg.P.S.i.; P.O.
- Zeev. Gn. N. Vh.** ..... Nieuwe Verhandelingen van het Zeeuwsch Genootschap der Wetenschappen. Middelburg.  
1807—35. B.M.; Camb.U.i.; N.H.M.; Oxon.B.; R.S.
- Z. Elektch.** ..... Zeitschrift für Elektrochemie. Halle a. S.  
1895— [Continuation of: Zeitschrift für Elektrotechnik und Elektrochemie, 1894—95.] Camb.P.S.i.; Camb.U.; Chem.S.; Glasg.P.S.i.; Glasg.U.i.; Oxon.R.i.; P.O.; S.K.; U.C.L.
- Z. Elekttech. Elektch.** ... Zeitschrift für Elektrotechnik und Elektrochemie. Halle a. S.  
1894—95. [Continued as: Zeitschrift für Elektrochemie, 1895—] Camb.U.; Chem.S.; Glasg.P.S.i.; P.O.; S.K.; U.C.L.
- Z. Ethnol.** ..... Zeitschrift für Ethnologie. Berlin.  
1869— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.D.S.; Dub.R.I.A.; Edinb.U.; N.H.M.i.; Oxon.B.; Oxon.R.; R.C.Surg.; U.C.L.
- Z. Hyg.** ..... Zeitschrift für Hygiene [und Infectiouskrankheiten]. Leipzig.  
1886— B.M.; Camb.U.; Chem.S.i.; Edinb.U.; Glasg.U.i.; I.CE.i.; Oxon.R.; P.O.i.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Z. Instk.** ..... Zeitschrift für Instrumentenkunde. Organ für Mittheilungen aus dem gesammten Gebiete der wissenschaftlichen Technik. Berlin.  
1881— B.M.; Camb.U.; Chem.S.; Edinb.U.; Oxon.R.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.i.

## List of Serial Publications

- Živa** ..... Živa: Časopis přírodnický. Praze (Prag).  
1853—68. B.M.; Linn.S.i.; N.H.M.
- Z. Kr.** ..... Zeitschrift für Krystallographie und Mineralogie. Leipzig.  
1877— B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Edinb.R.S.;  
Edinb.U.i.; Geol.M.; Geol.S.; N.H.M.; Oxon.R.; P.O.; R.S.;  
S.K.
- Z. Math. Pa.** ..... Zeitschrift für Mathematik und Physik; Schlömilch. Leipzig.  
1856— B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.D.S.i.; Dub.R.I.A.i.;  
Dub.T.C.i.; Edinb.U.; Glasg.U.i.; Math.S.i.; Oxon.B.(R.); R.S.;  
S.K.; U.C.L.i.  
*See Schlömilch Z.*
- Z. Nw.** ..... Zeitschrift für die gesammten Naturwissenschaften; herausgegeben  
von dem Naturwissenschaftlichen Vereine für Sachsen und  
Thüringen in Halle; Giebel. Berlin.  
1853— [Continuation of: Jahresbericht des Naturwissenschaftlichen  
Vereins, 1848—52.] B.M.; Camb.U.i.; Dub.N.L.I.i.; Dub.R.D.  
S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Linn.S.; N.H.M.;  
Oxon.B.; Oxon.R.; R.S.; S.K.  
*See Halle Z.*
- Z. Ohrh.** ..... Zeitschrift für Ohrenheilkunde. Wiesbaden.  
1879— [Continuation of: Archiv für Augen- und Ohrenheilkunde,  
1869—78.] B.M.; Camb.U.; R.C.Surg.i.
- Z. Pl. C.** ..... Zeitschrift für Physiologische Chemie. Strassburg.  
1877— Camb.U.; Chem.S.; Dub.N.L.I.i.; Edinb.U.; Glasg.U.;  
Oxon.R.; Pharm.S.; P.O.i.; R.C.Surg.; S.K.; U.C.L.
- Z. Pa. C.** ..... Zeitschrift für Physikalische Chemie, Stöchiometrie und Ver-  
wandtschaftlehre. Leipzig.  
1887— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.i.;  
Dub.R.C.S.i.; Edinb.U.; Glasg.U.; N.H.M.; Oxon.R.i.; P.O.i.;  
R.C.Surg.; R.S.; S.K.; U.C.L.
- Z. Psychol.** ..... Zeitschrift für Psychologie und Physiologie der Sinnesorgane.  
Hamburg, Leipzig.  
1890— B.M.; Camb.U.; Edinb.U.; Glasg.U.; Oxon.B.; Oxon.R.;  
R.C.Surg.; R.S.; U.C.L.
- Zür. Mtschr.** ..... Monatschrift des Wissenschaftlichen Vereins in Zürich; Hitzig, etc.  
Zürich.  
1856—59. B.M.; Camb.U.; N.H.M.; Oxon.B.; R.S.
- Zür. Mt.** ..... Mittheilungen der Naturforschenden Gesellschaft in Zürich. Zürich.  
1847—56. Chem.S.i.; Dub.R.I.A.; Edinb.R.S.i.; Linn.S.; N.H.M.;  
R.A.S.; R.Geogr.S.i.; R.S.; S.K.
- Zür. N. D. Sch. Gs.** ..... Neue Denkschriften der allgemeinen Schweizerischen Gesellschaft  
für die gesammten Naturwissenschaften. Neuchâtel, Zurich, etc.  
1837— B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.;  
Edinb.R.S.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.B.; R.C.Surg.i.;  
R.S.; S.K.  
*See Sch. Gs. N. D.*
- Zür. Nf. Gs. Njbl.** ..... An die Zürcherische Jugend... von der Naturforschenden Gesellschaft.  
Zürich.  
1799—1870. [Continued as: Neujahrsblatt herausgegeben von der  
Naturforschenden Gesellschaft in Zürich, 1871—] Camb.P.S.;  
Camb.U.i.; N.H.M.; R.S.
- Zür. Pa. Gs. Jbr.** ..... Jahresbericht der Physikalischen Gesellschaft in Zürich. Uster-  
Zürich.  
1887— R.S.
- Zür. Vjschr.** ..... Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich.  
Zürich.  
1856— B.M.; Camb.P.S.; Camb.U.i.; Chem.S.i.; Dub.R.I.A.;  
Edinb.R.S.; Linn.S.i.; Math.S.i.; N.H.M.; R.A.S.; R.Geogr.S.i.;  
R.S.; S.K.
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# PHYSICS

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- , heat and fire, philosophy. *Hutton, J.* Edinb. R. S. T. 4 (1798) (Hist.) 7-.
- and sound. *Girard de Caudemberg, —.* Dijon Ac. Mm. (1830) (livr. 2) 16-.
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- , theory of gases. *Berthold, G. (of Ronsdorf).* A. Ps. C. 159 (1876) 659-.
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- , original. *Gerland, E.* Lpldina. 25 (1889) 162-.
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 Clark, *Josiah Latimer*. Elect. Rv. 43 (1898) 663-; Elekttech. Z. 19 (1898) 777-; J. Tél. 22 (1898) 278; Lpldina. 34 (1898) 170; Science 8 (1898) 704-; As. S. M. Not. 59 (1899) 219-; Elect. 42 (1899) 33; I. CE. P. 137 (1899) 418-; I. Elect. E. J. 27 (1899) 646-, 649-; 28 (1899) 667-; L. Ps. S. P. 16 (1899) (Ann. Meet. 1899) 9-; Nt. 59 (1898-99) 33.  
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 Cooper, *Matthew*. I. Elect. E. J. 29 (1900) 948-.  
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Doyle, *James Drummond*. I. Elect. E. J. 29 (1900) 949-.

Draper, *Henry*. Am. J. Sc. 25 (1883) 89-; Obs. 6 (1883) 23-; Science 1 (1883) 29-.

Draper, *John William*. Am. J. Sc. 23 (1882) 163-; L. Ps. S. P. 5 (1884) (Ann. Meet. 1882) 8-.

Dresing, *Peter Christian*. I. Elect. E. J. 28 (1899) 672-.

Drobisch, *Moritz Wilhelm*. Leip. Mth. Ps. B. 48 (1896) 697-.

Droop, *Henry Richmond*. L. Ps. S. P. 6 (1885) (Ann. Meet. 1885) 8-.

Drummond, *Richard Oliver Gardner*. I. CE. P. 134 (1898) 414-; I. ME. P. (1898) 533; I. Elect. E. J. 28 (1899) 673.

Du Bois-Reymond, *Emil*. C. Ztg. 20 (1896) 1035; Am. Ntlist. 31 (1897) 268-; Arch. An. Pl. (Pl. Ab.) (1897) vii-; Berl. Ps. Gs. Vh. (1897) 5-; Bl. Cb. 17 (1897) 81-; Elect. 38 (1897) 316-; Elekttech. Z. 18 (1897) 10-; Gen. S. Ps. Mm. 32 (1894-97) Pt. 2, lxi-; Lpldina. 33 (1897) 50-; Manch. Lt. Ph. S. Mm. & P. 41 (1897) xlviii-; Nt. 55 (1896-97) 230-; Rv. Sc. 7 (1897) 385-; Rv. Sper. Freniatr. 23 (1897) 255; Science 5 (1897)

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Edlund, *Eric*. Elect. 21 (1888) 595-; Lpldina. 24 (1888) 169-; Lum. Elect. 29 (1888) 632-; Helsingf. Öfv. 31 (1889) 247-; Stockh. Vt. Ak. Lefn. 3 (1886-94) 281-.

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Eisenlohr, *Wilhelm*. Leip. As. Gs. Vjschr. 7 (1872) 263-; Karlsruhe Nt. Vr. Vh. 13 (1900) (Ab.) 458-.

Elliot, (*Sir*) *George*. Elekttech. Z. 15 (1894) 28; I. CE. P. 116 (1894) 355-; I. & S. I. J. (1894) (No. 1) 390-.

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Fasoldt, *Chas*. Mer. S. J. (1889) 829-.

Fawcett, *Henry*. J. Tél. 8 (1884) 235-.

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Foy, *Alphonse*. A. Tél. 15 (1888) 5-.

Frankland, (*Sir*) *Edward*. Am. C. J. 22 (1899) 410-; Anal. 24 (1899) 225-; Berl. B. 32 (1899) 2540-; 33 (1900) 3847-; C. N. 79 (1899) 81-; C. R. 129 (1899) 1060-; C. Ztg. 23 (1899) 697; Lpldina. 35 (1899) 179; Mon. Sc. 13 (1899) 771-; Nt. 60 (1899) 372; S. Afr. C. Mtl. S. J. 2 (1899) 181-; S. Afr. C. Mtl. S. P. 2 (1897-99) 835; S. C. In. J. 18 (1899) 735; Z. Angew. C. (1899) 822-; Manch. Lt. Ph. S. Mm. & P. 44 (1900) xxxviii-; Md.-Chir. T. 83 (1900) cxxx; Wien Alm. 50 (1900) 289-; Münch. Ak. Sb. 30 (1901) 373-.

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Gouin, *Ernest*. Gén. Civ. 6 (1884-85) 370; Par. Ing. Civ. Mm. (1885) (Pt. 1) 569-.

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Guerout, *Auguste*. Lum. Elect. 19 (1886) 433.

Guibal, *Théophile*. Gén. Civ. 13 (1888) 366; Par. Ing. Civ. Mm. (1888) (Pt. 2) 531-; Rv. Un. Mines 4 (1888) i-; Hain. S. Mm. 2 (1890) xix-; Fed. I. Mn. E. T. 1 (1892) 79-.

Guidi, *Filippo*. Rm. N. Linc. At. 53 (1900) 50-.

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Guillaume, *F. C. Lum.* Élect. 26 (1887) 595.

Gusinde, *Oswald*. Elekttech. Z. 17 (1896) 792.

Guthrie, *Francis*. J. Bt. 37 (1899) 528; Nt. 61 (1899-1900) 84.

Guthrie, *Frederick*. Gl. S. QJ. 43 (1887) (P.) 48; L. Ps. S. P. 8 (1887) (Ann. Meet. 1887) 9-; Nt. 35 (1887) 8-; Termt. Közl. 19 (1887) 505.

Gylden, *Johann August Hugo*. C. B. 123 (1896) 771-; Lpldina. 32 (1896) 189; Obs. 19 (1896) 446; St. Pét. Ac. Sc. Bll. 5 (1896) lxxvii-; Acta Mth. 20 (1897) 397-; As. Nr. 142 (1897) 49-; As. S. M. Not. 57 (1897) 222-; Bll. As. 14 (1897) 289-; Ciel et Terre 17 (1896-97) 568-; Helsingf. Acta 23 (1897) No. 9, 29 pp.; Leip. As. Gs. Vjschr. 32 (1897) 8-; Nt. 55 (1896-97) 38, 158-; Wiad. Mt. 1 (1897) 31-; Münch. Ak. Sb. 27 (1898) 409-.

Hachette, *Jean Nicolas Pierre*. Fr. S. Ag. Mm. (1834) 143-.

Hänsch, *Hermann*. Berl. Ps. Gs. Vh. (1896) 77-.

Haidinger, *Wilhelm Karl von*. Ausl. 44 (1871) 449-; Bonn Cor.-Bl. NH. Vr. (1871) 15-; Rv. Cours Sc. 1 (1871) 410-; Wien Alm. (1871) 159-; Wien Jb. Gl. 21 (1871) 31-; R. S. P. 20 (1872) xxv-; Mag. Tud. Ak. Évk. 13 (1876) (No. 10) 15-.

Hajech, *Camillo*. Mil. I. Lomb. Rd. 17 (1884) 56-.

Hake, *Rudolph*. Elekttech. Z. 18 (1897) 281.

Hallaschka, *Franz Cassian*. Brünn Mt. 65 (1885) (Beil.) 33.

Hallauer, *Octave René*. Mulhouse S. In. Bll. 54 (1884) 139-; Science 4 (1884) 306-.

Halske, *Johann Georg*. Berl. Ps. Gs. Vh. (1890) 39-.

Hamilton, (Sir) *William Rowan*. Am. J. Sc. 42 (1866) 293-; As. S. M. Not. 26 (1866) 109-; Ir. Ac. P. 9 (1867) 307-.

Hampson, *Robert Stewart*. I. Elect. E. J. 28 (1899) 875-.

Hankel, *Wilhelm Gottlieb*. Elekttech. Z. 20 (1899) 181; Leip. Mth. Ps. B. 51 (1899) lxxvii-; Lpldina. 35 (1899) 58-; Ps. Rv. 9 (1899) 58; Münch. Ak. Sb. 30 (1901) 348-.

Harris, (Sir) *William Snow*. R. S. P. 16 (1868) xviii-.

Harting, *Pieter*. Lpldina. 21 (1885) 215; Amst. Ak. Jb. (1888) 1-.

Hartnack, *Edmund*. Termt. Közl. 24 (1892) 642; Ts. Ps. C. 31 (1892) 64.

Hasler, *Gustav*. Sch. Nf. Gs. Vh. (1900) xlviiii-.

Haughton, (Rev.) *Samuel*. Gl. Mg. 4 (1897) 573-; I. ME. P. (1897) 514-; Mn. Mg. 11 (1897) 346-; Gl. S. QJ. 54 (1898) lxxvi-; Ir. Ntlist. 7 (1898) 1-; Nt. 57 (1897-98) 65-; R. S. P. 62 (1898) xxix-.

Hausmann, *Johannes*. Elekttech. Z. 21 (1900) 1004.

Hawksley, *Thomas*. I. & S. I. J. (1893) (No. 2) 290; Nt. 48 (1893) 522; I. CE. P. 117 (1894) 364-; Met. S. QJ. 20 (1894) 111-; R. S. P. 55 (1894) xvi-.

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- Hearder, *Jonathan Nash*. Devon. As. T. 9 (1877) 55-; Plym. I. T. 6 (Pt. 1) (1877) 150-.  
 Heid, *Hermann*. Wien Pht. Cor. 28 (1891) 214-.  
 Heller, *Agost*. Mth. Nt. B. Ung. 18 (1903) 473-.  
 Helmholtz, *Hermann Ludwig Ferdinand von*. A. d'Ocul. 112 (1894) 225-; Arch. f. Oph. 40 (1894) (Ab. 4) [v]-; Arch. Oph. 23 (1894) 514-; Arch. Ot. 23 (1894) 382; Berl. B. 27 (1894) 2643-; Bresl. Schl. Gs. Jbr. (1894) (*Allg. B.*) 32-; [Bucarest S. Sc. Bl. 3 (1894)] 260-; C. N. 70 (1894) 146; C. R. 119 (1894) 1044-; C. Ztg. 18 (1894) 1995; Cztg. Opt. 15 (1894) 205-; Dubl. J. Md. Sc. 98 (1894) 459-; Elect. Rv. 35 (1894) 819-; Elekttech. Z. 15 (1894) 613-; J. Tél. 18 (1894) 358; Lpldina. 30 (1894) 163; Mon. Sc. 8 (1894) 782, 801-; Nt. 50 (1894) 479-; Rv. Sc. 2 (1894) 379, 429-; 8 (1897) 321-, 360-; Rv. Sc.-Ind. 26 (1894) 160; Rv. Sper. Freniatr. 20 (1894) 671-; Smiths. Rp. (1894) 709-; (1895) 787-; St. Pét. Ac. Sc. Bl. 1 (1894) (*Prot.*) 51-; Wien Md. Wschr. 44 (1894) 1645-; 46 (1896) 1-, 44-, 98-; Z. Instk. 14 (1894) 841-; Z. Nw. 67 (1894) 321-; Am. Ac. P. 30 (1895) 592-; Ciel et Terre 15 (1894-95) 422; Crelle J. Mth. 114 (1895) 353; Frkf. a. M. Ps. Vr. Jbr. (1894-95) 24-; Fsch. Md. 13 (1895) 123-, 163-; I. CE. P. 119 (1895) 361-; Königsb. Sohr. 35 (1895) 63-, [38]; L. Ps. S. P. 13 (1895) (*Ann. Meet.*) 9-; Manch. Lt. Ph. S. Mm. & P. 9 (1895) 230-; Md.-Chir. T. 78 (1895) cvi; Phm. J. 25 (1895) 222; Ps. Rv. 2 (1895) 222-; Senckb. Nf. Gs. B. (1895) v-; Term. Közl. 27 (1895) 18-; Wien Alm. 45 (1895) 283-; Z. Ohrh. 26 (1895) 252-; Zür. Nf. Gs. Njbl. (1895) 36 pp.; Berl. Ak. Ab. (1896) 50 pp.; C. S. J. 69 (1896) 885-; Münch. Ak. Sb. 25 (1896) 185-; R. I. P. 14 (1896) 481-; R. S. P. 59 (1896) xvii-; Science 3 (1896) 189-; Würth. Jh. 52 (1896) ci-; Gen. S. Ps. Mm. 32 (1894-97) (Pt. 1) lxxvi-; Heidl. Nt. Md. Vh. 5 (1897) 315-; N. Antol. Sc. 171 (1900) 710-; Practit. 64 (1900) 664-.  
 Hemenway, *Frank F.* Am. Eng. & Railroad J. 72 (1898) 884.  
 Henry, *Joseph*. Am. J. Sc. 15 (1878) 462-; Smiths. Rp. (1878) 143-; Waah. Ph. S. Bl. 2 (1875-80) 203-; Smiths. Misc. Col. 20 (1881) Art. 2, 203-; 21 (1881) Art. 3, 514 pp.; 30 (1887) x+523 and vi+559 pp.; Elect. 28 (1892) 327-, 348-, 407-, 661-; Elect. Rv. 46 (1900) 77-, 88-.  
 Hermann, *Rudolph*. Mosc. S. Nt. Bl. 54 (1879, Pt. 2) (1880) 159-; St. Pet. Mn. Gs. Vh. 16 (1881) 1-.  
 Herschel, (*Sir*) *John Frederick William*. Brux. Ac. Bl. 31 (1871) 478-; Smiths. Rp. (1871) 109-; Am. Ph. S. P. 12 (1872) 217-; As. S. M. Not. 32 (1872) 122-; Edinb. R. S. P. 7 (1872) 543-; R. S. P. 20 (1872) xvii-; Rv. Sc.-Ind. 3 (1872) 40-; Am. Ac. P. 8 (1873) 461-; Wien Alm. (1873) 147-; Mag. Tud. Ak. Étk. (*Mth.*) 3 (1875) (No. 3) 14 pp.; Wien Pht. Cor. 24 (1887) 7-.  
 Hertz, *Heinrich Rudolph*. Frkf. a. M. Ps. Vr. Jbr. (1892-93) 56-; Z. Nw. 66 (1893) 370-; Berl. Ps. Gs. Vh. (1894) 9-; C. Ztg. 18 (1894) 21; Elect. 32 (1894) 273; 33 (1894) 272-, 299, 332-, 415-; Elekttech. Z. 15 (1894) 28; Lpldina. 30 (1894) 54-; Lum. Elect. 51 (1894) 150, 241-; Manch. Lt. Ph. S. Mm. & P. 8 (1894) 214-; N. Cim. 35 (1894) 5-; Nt. 49 (1893-94) 265-; Ps. Rv. 1 (1894) 383-; Rv. Sc. 1 (1894) 123-; Rv. Sc.-Ind. 26 (1894) 82; Smiths. Rp. (1894) 719-; Term. Közl. 26 (1894) (*Suppl.*) 49-; Ts. Ps. C. 33 (1894) 129-; Wien Alm. 44 (1894) 263-; Erlang. Ps. Md. S. Sb. 26 (1895) 15-; Münch. Ak. Sb. 24 (1895) 146-; Karlsruhe Nt. Vr. Vh. 11 (1896) (*Ab.*) 355-; R. I. P. 14 (1896) 321-; Gen. S. Ps. Mm. 32 (1894-97) Pt. 1, lxi-; Danzig Schr. 9 (1895-98) (*Heft* 1) xxv-.  
 Hess, *Johann Jakob*. Zür. Vjschr. 41 (1896) (*Festschr.*, Th. 1) 124-.  
 Hessel, *Johann Friedrich Christian*. N. Jb. Mn. (1896) (*Bd.* 2) 107-.  
 Hick, *John*. I. CE. P. 117 (1894) 379-; I. ME. P. (1894) 161-; I. & S. I. J. (1894) (*No.* 1) 391.  
 Higginson, *Alfred*. Lpool. Lt. Ph. S. P. 39 (1885) xl-.  
 Hilger, *Adam*. Asps. J. 6 (1897) 139-; Nt. 56 (1897) 34; As. S. M. Not. 58 (1898) 138.  
 Hipp, *Matthäus*. Elekttech. Z. 14 (1893) 323-, 715; Neuch. S. Sc. Bl. 24 (1896) 212-.  
 Hirn, *Gustav Adolph*. Bône Ac. Hip. Bl. 24 (1891) (C. R. 1890) iii-; Brux. Ac. Bl. 19 (1890) 175-; 20 (1890) 182-; C. R. 110 (1890) 115-; Lpldina. 26 (1890) 56; Manch. Lt. Ph. S. Mm. & P. 3 (1890) 159-; Nt. 41 (1890) 323-; Par. Ing. Civ. Mm. (1890) (Pt. 1) 109-; Rio Obs. Rv. (1890) 41-; Rv. Sc. 45 (1890) 193-; Rv. Sc.-Ind. 22 (1890) 60; A. Cons. Arts et Mét. 3 (1891) 276-; Term. Közl. 23 (1891) 633; Ts. Ps. C. 30 (1891) 63.  
 Hirst, *Thomas Archer*. Lpldina. 28 (1892) 59; Nt. 45 (1892) 399-; As. S. M. Not. 53 (1893) 218-; L. Ps. S. P. 12 (1894) (*Ann. Meet.*) 1893) 9; R. S. P. 52 (1893) xii-.  
 Höpfner, *C.* Z. Nw. 73 (1900) 367-.  
 Hoffmann, *Josef*. Wien Pht. Cor. 34 (1897) 320.  
 Hofstede, *J. P.* Elekttech. Z. 14 (1893) 204.  
 Hoh, *Theodor*. Berl. Ps. Gs. Vh. (1888) 61-; Bamb. Nf. Gs. B. 15 (1890) iii-.  
 Holloway, *Josephus Flavius*. Am. Eng. & Railroad J. 70 (1896) 264; Am. I. Mn. E. T. 26 (1897) 827-.  
 Homolatsch, *Josef*. Wien Pht. Cor. 25, (1888) 217-.  
 Hopkinson, *John*. Elect. 41 (1898) 622-; Elect. Rv. 43 (1898) 338-; Elekttech. Z. 19 (1898) 617; I. ME. P. (1898) 534-; J. Tél. 22 (1898) 278-; L. Mth. S. P. 29 (1898) 727-; Nt. 58 (1898) 419-; I. CE. P. 135 (1899) 338-; I. Elect. E. J. 27 (1899) 647-; 28 (1899) 676-; L. Ps. S. P. 16 (1899) (*Ann. Meet.* 1899) 9; R. S. P. 64 (1899) xvii-.  
 Hoppe, *Ernst Reinhold Eduard*. D. Ps. Gs. Vh. (1900) 183-; Lpldina. 36 (1900) 132.

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Horner, *Johann Caspar*. Zür. Vjschr. 41 (1896) (*Festschr.*, Th. 1) 79-.

Horner, *Johann Jakob*. Zür. Vjschr. 41 (1896) (*Festschr.*, Th. 1.) 227-.

Hornig, *Emil*. Wien Ph. Cor. 27 (1890) 57-.

Howard, *James Livsey*. L. Ps. S. P. 17 (1901) (*Ann. Meet.* 1900) 13-; Ph. Mg. 49 (1900) 160.

Hubbard, *Gardiner Greene*. Science 6 (1897) 974-; Gg. J. 11 (1898) 186.

Huet, *Adrien*. 's Gravenh. I. Ing. Ts. (1898-99) (*Verg.*) 162-.

Hughes, *David Edward*. Elect. 44 (1900) 457-; Elect. Rv. 46 (1900) 185-; Elekttech. Z. 21 (1900) 120; I. Elect. E. J. 29 (1900) 950-; J. Tél. 24 (1900) 63-; Lpldina. 36 (1900) 49; L. Ps. S. P. 17 (1901) (*Ann. Meet.* 1900) 12; Nt. 61 (1899-1900) 325-.

Humboldt, *Pierre Césaire*. A. Tél. 12 (1885) 573-.

Hunt, *J. Gibbons*. Am. Mcr. S. P. 14 (1892) 166-.

Hunt, *Robert*. Nt. 37 (1888) 14; Phot. J. 12 (1888) 77-; Yorks. Gl. S. P. 10 (1889) 243-; B. S. P. 47 (1890) i-.

I'Anson, *James*. I. & S. I. J. (1898) (No. 1) 317; Nt. 57 (1897-98) 566.

Iselin, *J. F.* L. Ps. S. P. 6 (1885) (*Ann. Meet.* 1885) 11-.

Jablochhoff, *Paul*. Elect. 32 (1894) 663-; J. Tél. 18 (1894) 171; Lum. Élect. 52 (1894) 95-.

Jackson, *George*. Mcr. S. J. (1895) 16.

Jacobi, *Moritz Hermann von*. St. Pét. Ac. Sc. Bll. 21 (1876) 261-; St. Pet. Ac. Sc. Mm. (*Ra.*) 28 (1876) 61-.

Jamin, *Jules Célestin*. Aér. (1886) 43-; C. R. 102 (1886) 339-; Gén. Civ. 8 (1885-86) 255; Lpldina. 22 (1886) 58; Lum. Élect. 19 (1886) 375-; N. Cim. 19 (1886) 96; Nt. 33 (1886) 374, 493-; Rv. Sc.-Ind. 18 (1886) 94-; Tel. J. 18 (1886) 177; Ts. Ps. C. 27 (1888) 286.

Jedlik, *Ányos István*. Nt. 53 (1895-96) 516-; Term. Kozl. 28 (1896) 637-; 29 (1897) 387-; Mag. Tud. Ak. Éts. 8 (1897) 273-; Mth. Nt. B. Ung. 15 (1899) 401-.

Jellett, (*Rev.*) *John Hewitt*. Nt. 37 (1888) 396-.

Jenkin, *Henry Charles Fleeming*. A. Tél. 12 (1885) 286-; Elect. 15 (1885) 97; I. CE. P. 82 (1885) 365-; I. ME. P. (1885) 458-; J. Tél. 9 (1885) 137-; Lum. Élect. 16 (1885) 629; Nt. 32 (1885) 153-; Tel. E. J. 14 (1885) 345-; Tel. J. 16 (1885) 554-; R. S. P. 39 (1886) i-; Edinb. B. S. P. 14 (1888) 117 (*bis*)-.

Johannes, *Bernhard*. Wien Ph. Cor. 36 (1899) 295-.

Johnson, *Charles Roberts*. Am. Eng. & Railroad J. 67 (1893) 499-.

Jolly, *Philipp Johann Gustav von*. Lpldina. 20 (1884) 224; Met. Z. 2 (1885) 276-; Münch. Ak. Sb. 15 (1886) 119-.

Jones, *Thomas P.* Franklin I. J. 130 (1890) 1-.

Jones, (*Capt.*) *William Richard*. Railroad & Eng. J. 63 (1889) 531-; I. & S. I. J. (1890) (No. 1) 179-.

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Jordan, *Thomas Brown*. Cornwall Pol. S. Rp. (1890) 18-.

Joule, *James Prescott*. C. Ztg. 13 (1889) 1409; Educ. Times 42 (1889) 472; Elect. 23 (1889) 600-; Lpldina. 25 (1889) 216-; Lum. Elect. 34 (1889) 195-; Magdeb. Nt. Vr. Jbr. u. Ab. (1889) 75; Méx. Obs. Bl. 2 (1889) 408; Nt. 40 (1889) 613-; Tel. J. 25 (1889) 457-; Am. Ac. P. 25 (1890) 346-; C. S. J. 57 (1890) 449-; Glasg. I. Eng. T. 33 (1890) 210-; L. Ps. S. P. 10 (1890) (*Ann. Meet.* 1890) 10-; Term. Kozl. 22 (1890) 81-; Tor. Ac. Sc. At. 25 (1890) 36-; Ts. Ps. C. 29 (1890) 29-.

Jousselin, *Paul Louis*. Par. Ing. Civ. Mm. (1893) (*Pt.* 2) 416-; Gén. Civ. 24 (1893-94) 63.

Jovanovits, *Anastas*. Wien Ph. Cor. 36 (1899) 730-.

Kambly, *Ludwig*. Bresl. Schl. Gs. Jbr. (1887) 403-.

Kargl, *Franz*. Wien Ph. Cor. 30 (1893) 553-.

Karsten, *Gustav*. D. Ps. Gs. Vh. (1900) 147-; Lpldina. 36 (1900) 49-.

Kastner, *Karl Wilhelm Gottlob*. Arch. Phm. 146 (1858) 321-; 151 (1860) 93-.

Kaven, *August von*. Hann. Archt.-Vr. Z. 37 (1891) 445-.

Kelland, *Philip*. R. S. P. 29 (1879) vii-; Edinb. R. S. P. 10 (1880) 321-.

Kimball, *Alonzo Smith*. Am. Ac. P. 33 (1898) 524-; Science 7 (1898) 54-.

King, *Frank*. I. Elect. E. J. 29 (1900) 955-.

Kirchhoff, *Gustav Robert*. A. di C. 6 (1887) 380; Am. J. Sc. 34 (1887) 496; Berl. B. 20 (1887) 2771-; Bresl. Schl. Gs. Jbr. (1887) 172-; C. Ztg. 11 (1887) 1315; Cztg. Opt. 8 (1887) 265-; Elekttech. Z. 8 (1887) 457-; Lpldina. 23 (1887) 216; Lum. Élect. 26 (1887) 194-; Moncalieri Oss. Bll. 7 (1887) 192; Nt. 36 (1887) 606-; Obs. 10 (1887) 396; Oestr. Z. Brgw. 35 (1887) (*Beil.*) 100; Wien Md. Wschr. 37 (1887) 1416; Wien Ph. Cor. 24 (1887) 476-; Am. Ac. P. 23 (1888) 370-; As. Nr. 118 (1888) 47-; A. Tél. 15 (1888) 96; Humb. 7 (1888) 38; L. Ps. S. P. 9 (1888) (*Ann. Meet.* 1888) 12-; Phm. J. 18 (1888) 376; Term. Kozl. 20 (1888) (*Suppl.*) 23-; Tor. Ac. Sc. At. 23 (1887-88) 2-; Ts. Ps. C. 27 (1888) 872-; Wien Alm. 33 (1888) 193-; Gött. Ab. 35 (1889) (*Mth.*) 10 pp.; Münch. Ak. Sb. 18 (1889) 181-; Smiths. Rp. (1889) 527-; R. S. P. 46 (1890) vi-.

Kirk, *Alexander Carnegie*. I. ME. P. (1892) 405-; Glasg. I. Eng. T. 36 (1893) 320-; I. CE. P. 111 (1893) 380-; Nv. Archt. T. 34 (1893) 238-.

Kleiber, *Iosif Andreevič*. As. Nr. 129 (1892) 151-; Rs. Ps.-C. S. J. 24 (*Ps.*) (1892) 64-; As. S. M. Not. 53 (1893) 219-.

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Kœchlin, *Émile*. Mulhouse S. In. Bll. 54 (1884) 100-.

Kolbe, *Josef*. Elekttech. Z. 21 (1900) 1004.

Koller, *Karl*. Wien Pht. Cor. 27 (1890) 41-.

Kopp, *Charles Guillaume*. Neuch. S. Sc. Bll. 20 (1892) 146-.

Kovalevskij, *Sofja Vasiljevna*. Bll. Sc. Mth. 15 (1891) 212-; Christiania F. (1891) (Ov.) 8-; Crelle J. Mth. 108 (1891) 88; Lpldina. 27 (1891) 59-; Nt. 43 (1891) 375-; Palermo Cir. Mt. Bd. 5 (1891) 121-; Rv. Mt. 1 (1891) 21-; Rv. Quest. Sc. 29 (1891) 595-; A. Mt. 19 (1891-92) 201-; As. & Asps. 11 (1892) 281-; Acta Mth. 16 (1892-93) 385-; Rec. Mth. (Moscou) 16 (1893) 1-.

Kraevič, *Konstantin Dmitrievič*. Rs. Ps.-C. S. J. 24 (Ps.) (1892) 66-.

Kramer, *Oscar*. Wien Pht. Cor. 29 (1892) 264-.

Kroh, *Carl*. Wien Pht. Cor. 24 (1887) 46.

Kruesi, *John*. I. Elect. E. J. 28 (1899) 678-.

Kundt, *August Adolf Eduard Eberhard*. Berl. B. 27 (1894) 1374-; Berl. Ps. Gs. Vh. (1894) 61-; Elekttech. Z. 15 (1894) 307-, 409-; Lpldina. 30 (1894) 155-; Mosc. S. Sc. Bll. 91 (No. 1) (1894) 35-; Nt. 50 (1894) 152-; St. Pét. Ac. Sc. Bll. 1 (1894) (Prot.) 27-; Ts. Ps. C. 33 (1894) 128; Z. Nw. 67 (1894) 84-; Kazan S. Ps.-Mth. Bll. 4 (1895) (Prot.) 97-; Manch. Lt. Ph. S. Mm. & P. 9 (1895) 212-; Ps. Rv. 2 (1895) 68-; Vars. S. Nt. Tr. (1894-95) (C. R., Ps. C.) 127-; Erlang. Ps. Md. S. Sb. 27 (1896) 54-; Münch. Ak. Sb. 25 (1896) 177-; Gen. S. Pa. Mm. 32 (1894-97) Pt. 1, lxxiii-.

Lacoiné, *Émile Henri (Effendi)*. J. Tél. 23 (1899) 66; Lyon S. Ag. A. 7 (1901) 33-.

Ladd, *William*. Elect. 14 (1885) 495; As. S. M. Not. 46 (1886) 191-.

Lafaye, *François Louis Léonard de*. Caen Ac. Mm. (1891) (Pt. 2) 96-.

Lagarde, *Henri*. Doubs S. Mm. 5 (1891) xv-, 403-.

Lagarde, *Joseph*. A. Tél. 24 (1898) 91-.

Lallemand, *Alexandre*. Lpldina. 22 (1886) 112.

Lamartine, *Louis François de*. Mâcon Ac. A. 11 (1895) 198-.

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Lander, *James Nelson*. Am. Eng. & Railroad J. 68 (1894) 472.

Landrath, *Friedrich Wilhelm Eduard*. Elekttech. Z. 19 (1896) 629.

Landsberg, *Carl*. Czdg. Opt. 12 (1891) 97.

Laplace, *Pierre Simon (le marquis) de*. Hall Bij. 2 (1826) 284-; Par. Mm. Ac. Sc. 10 (1831) (H.) 81-; Pop. As. 3 (1896) 1-.

Lapšin, *Vasilij Ivanovič*. N. Rs. S. Nt. Mm. 13 (No. 2) (1888) 2 pp.

Lartigue, *Henry*. A. Tél. 11 (1884) 461-.

Laurens, *Camille*. Gén. Civ. 18 (1890-91) 194-.

Lavalley, *Alexandre Théodore*. Gén. Civ. 21 (1892) 219; Par. Ing. Civ. Mm. (1892) (Pt. 2) 1002-; I. CE. P. 111 (1893) 383-; I. ME. P. (1893) 93-.

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Lea, *Matthew Carey*. Am. J. Sc. 3 (1897) 428; Nt. 56 (1897) 35; Science 5 (1897) 767; Wien Pht. Cor. 34 (1897) 320; Franklin I. J. 145 (1898) 143-.

Leboucher, *Jacques Arsène*. Caen Ac. Mm. (1891) (Pt. 2) 100-.

Le Conte, *John*. Am. J. Sc. 41 (1891) 525-; Am. Ntlist. 25 (1891) 412; As. S. Pac. Pb. 3 (1891) 254-; Science 17 (1891) 257; Calif. Ac. P. 3 (1893) 361-.

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- Experiments and apparatus, new. *Rebenstorff, H. A.* Dresden Isis Sb. (1899) 10.
- , classification. *Fournier-d'Albe, E. E.* Elect. 36 (1896) 721-.
- : composition of vibrations; diffusion; analysis of polarised light. *Röntgen, W. C. A.* Ps. C. 40 (1890) 109-.
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- Historical element in teaching. *Haas, K. D.* Nf. Vh. (1894) (Th. 2, Hälfte 1) 309-.
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- Magnets, experiments. *Krebs, G.* Carl Rpm. 17 (1881) 659-.
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- Mathematics in teaching of physics, importance. *Calzecchi, T.* Rv. Sc.-Ind. 30 (1898) 65-.
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- , new exhibition-. *Anon.* Mcr. S. J. (1900) 714-.
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- — — in modern education. *Rouland, H. A.* Educ. Times 43 (1890) 382-.
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- — —, right and wrong methods. *Angell, J.* Educ. Times 41 (1888) 467-.
- Physics and chemistry, position as branches of education. *Wilbrand, F.* Humb. 8 (1889) 369-.
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- , programme. *Serrano y Fatigati, E.* Ph. Mg. 1 (1876) 455-.
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- , — in the "Istituti Tecnici." *Semmola, E.* Nap. I. Inc. At. 5 (1892) No. 7, 4 pp.
- , — — schools (report of B. A. Committee). *Foster, G. C.* B. A. Rp. (1874) 71-.
- , — — —. *Croft, W. B.* Educ. Times 46 (1893) 428-.
- Polarisation of light, apparatus for explaining. *Macé de Lépinay, J.* Par. S. Ps. Sé. (1888) 327-.

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- Polarisation model, composition of 2 circular movements, apparatus. *Schaik, W. C. L. van.* Mbl. Nt. (1887) 18-; Fsch. Ps. (1887) (Ab. 2) 4.
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- , hydrostatics and mechanics, apparatus and experiments. *Schuller, A.* Term. Közl. 23 (1891) (Suppl.) 40-, 91-, 174-; Mth. Nt. B. Ung. 12 (1895) 339-.
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- Italian Society of Spectroscopists. *Faye, H.* *A. É. C. R.* 74 (1872) 913-, 1240-.
- Italy, Mount Vesuvius Observatory. *Marcillac, P.* *Lum. Élect.* 17 (1885) 385-.
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- London, Royal Institution, old and new laboratories. *Spottiswoode, W.* *R. I. P.* 7 (1873) 1-.
- , University College, new science laboratories. *Smith, T. R., Beare, T. H., Fleming, J. A., & Foster, G. C.* *Br. Archt. J.* 1 (1894) 281-, 359-, 408.
- Manchester, Owens College, physical laboratory. *Anon.* *Nt.* 62 (1900) 250-.
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- Massachusetts, Williams College, Thompson physical laboratory. *Lefavour, H.* *Ps. Rv.* 1 (1894) 451-.
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- Oxford, laboratory of St John's College. *Bosanquet, R. H. M.* *Ph. Mg.* 10 (1880) 217-; 12 (1881) 178-.
- Paris, Conservatoire des Arts et Métiers, electricity at. *Laussedat, (col.) A.* *Lum. Élect.* 44 (1892) 51-.
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- Physical laboratories. *Stolétov, A. G.* *Mosc. S. Sc. Bll.* 41 (No. 2) (1884) 32-.
- Physico-chemical Institutes of Pianciani. *Volpicelli, P.* *G. Arcad.* 55 (1882) 282; 56 (1882) 257; 61 (1883) 257-; 67 (1886) 26-.
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- Russia, Physical Observatory. *Kupffer, A. T.* *Bb. Un. Arch.* 15 (1850) 18-.
- Sorbonne physical laboratory. *Ledeboer, P. H.* *Lum. Élect.* 15 (1885) 16-, 66-, 195-, 264-, 360-, 408-.
- Sydney University, new physical laboratory. *Threlfall, R.* *Aust. As. Rp.* (1888) 95-.
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- Warsaw Museum of Industry and Agriculture, physical laboratory. *Boguski, J. J.* *Prace Mt.-Fiz.* 1 (1888) 119-.

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- , industrial applications. *Fischer, H.* *Civing.* 38 (1892) 313-.
- Copper statue, 9 metres high, made electrolytically. *Bouilhet, H., & Christophe, —.* [1870] *St. Pét. Ac. Sc. Bll.* 15 (1871) 319-.
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- Electric coal-mining plant, Pennsylvania. *Gresley, W. S. I. CE. P.* 131 (1898) 100-.
- current, heat produced by, applications. *H., D.* *Sav. S. H. Nt. Bll.* 1 (1887) 17-.
- energy, price. *Grassi, G.* *Nap. I. Inc. At.* 11 (1898) No. 5, 6 pp.
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- , — to arts and manufactures. *Despret, V.* *Bru. A. Un.* (1856-57) 621-.
- , —, recent advances. *Gavey, J.* *Card. Nt. S. T.* 21 (1890) 97-.
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- , International Exhibition. English Post Office exhibit. *Preece, W. H.* *Lum. Elect.* 5 (\*1881) 36-.
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- Energy distribution by compressed air. *Milone, F.* *Nap. I. Inc. At.* 2 (1889) No. 5, 13 pp.

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- Energy, sources. *Whitmill, C. T.* Card. Nt. S. T. 16 (1885) 58-.
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- Heat, loss by furnace-gases. *Langhans, —.* Z. Vr. Rübensuckin. 39 (1899) 785-.
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- — fatty acids. *Cambacérés, —.* Dingler 95 (1845) 33-.
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- Calorimetry, nomenclature and notation. *Buchanan, J. Y.* Nt. 58 (1898) 30.
- Capacity for heat of unit volume. *Griffiths, E. H.* [1894] Nt. 51 (1894-95) 11-.
- Critical pressure, suggested definition. *Jude, R. H.* Nt. 60 (1899) 412-.
- Diffusivity. *Thomson, (Sir) W.* Par. S. Ps. Sé. (1888) 236-.
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- , —, —, liquids. *Wiener, L. C.* [1871] (XII) Karlsruhe Nt. Vr. Vh. 6 (1873) 213-.
- , —, new instance. *Zenner, D. C. N. 8* (1863) 164-.
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- , —, stationary, in infinite system of molecules. *Burbury, S. H.* L. Mth. S. P. 29 (1898) 225-.
- , —, of system of equal elastic spheres. *Burbury, S. H.* [1896] B. A. Rp. (1896) 716-; L. Mth. S. P. 28 (1897) 331-.
- , —, of systems of molecules. *Cauchy, A. L.* C. R. 24 (1847) 348-.

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- Boltzmann's minimum theorem. *Culverwell, E. P.* Nt. 50 (1894) 617-.
- , —, *Burbury, S. H.* [1894] Nt. 51 (1894-95) 78-.
- , —, *Watson, H. W.* [1894] Nt. 51 (1894-95) 105-.
- , —, *Culverwell, E. P.* Nt. 51 (1894-95) 105, 246-.
- , —, *Burbury, S. H.* Nt. 51 (1894-95) 320; 52 (1895) 104-.
- , —, *Culverwell, E. P.* Nt. 52 (1895) 149-.
- , —, *Boltzmann, L.* Nt. 52 (1895) 221-.
- , —, assumption in. *Bryan, G. H.* Nt. 52 (1895) 29-.
- , —, extension. *Burbury, S. H.* L. Mth. S. P. 26 (1895) 431-.
- , —, theorem (equilibrium of kinetic energy of system of particles). *Boltzmann, L.* Wien Sb. 58 (1868) (Ab. 2) 517-.
- , —, *Maxwell, J. C.* [1878] Camb. Ph. S. T. 12 (1879) 547-.
- , —, *Hicks, W. M.* B. A. Rp. (1885) 905-.
- , —, *Pirogov, N. N.* Rs. Ps.-C. S. J. 22 (Ps.) (1890) 44-; Exner Rpm. 27 (1891) 515-.
- , —, (Maxwell's investigation). *Rayleigh, (Lord).* Ph. Mg. 33 (1892) 356-.
- , —, (equality of mean kinetic energy for each degree of freedom). *Burbury, S. H.* L. Mth. S. P. 27 (1896) 214-.
- Cases in which kinetic energy is not integrating divisor of energy absorbed. *Boltzmann, L.* Wien Ak. Sb. 92 (1886) (Ab. 2) 853-.
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- Distribution of molecular velocities in gases. *Cellérier, C.* Arch. Sc. Ps. Nt. 6 (1881) 337-.
- , —, —, amongst molecules of fluid, law. *Buchanan, J.* Ph. Mg. 25 (1888) 165-.
- , —, rotatory energy among gas molecules. *Stankevič, B. V.* Rec. Mth. (Moscou) 13 (1886) 129-.
- , —, stable, of dynamic conditions among gas molecules. *Florinsky, G.* [1893] Fsch. Mth. (1893-94) 1817-.

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- — — in system of moving molecules, law. *Leahy, A. H.* Camb. Ph. S. P. 7 (1892) 322-.
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- — — in a gas. *Lorentz, H. A.* Wien Ak. Sb. 95 (1887) (Ab. 2) 115-.
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- — —, —. *Burbury, S. H.* Ph. Mg. 49 (1900) 226-; 50 (1900) 584-.
- — —, as regards translation and rotation, in molecules of gas. *Boltzmann, L.* Berl. Ak. Sb. (1888) 1395-.
- — — mean kinetic energy in perfect gas. *Eddy, H. T.* Am. As. P. (1889) 129.
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- —. *Burnside, W.* Nt. 45 (1892) 533.
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- —. *Kelvin, (Lord).* [1900] R. I. P. 16 (1902) 363-.
- —, test case disproving. *Kelvin, (Lord).* R. S. P. 51 (1892) 397-.
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- —, test cases. *Thomson, (Sir) W. (Lord Kelvin).* [1891] R. S. P. 50 (1892) 79-.
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- —. (— — — —) *Burnside, W.* [1887] Edinb. R. S. T. 33 (1888) 501-.
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- —. *Pirogov, N. N.* Rs. Ps.-C. S. J. 21 (Ps.) (1889) 76-.
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- — (Bertrand). *Boltzmann, L.* C. R. 122 (1896) 1173.
- — (Boltzmann). *Bertrand, J.* C. R. 122 (1896) 1174.
- — (Bertrand). *Boltzmann, L.* C. R. 122 (1896) 1314.
- — (Boltzmann). *Bertrand, J.* C. R. 122 (1896) 1314-.
- — of distribution of velocities for gas molecules. *Schütz, J. R.* Gött. Nr. (1895) 30-.
- — — — — — — —, proof. *Boltzmann, L.* Münch. Ak. Sb. 24 (1895) 207-.
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- — among polyatomic molecules, new proof of 2 laws. *Boltzmann, L.* Wien Ak. Sb. 95 (1887) (Ab. 2) 153-.
- Pressure of gas, critical account of theories. *Gosiewski, W.* Par. T. Nauk Śc. Pam. 5 (\*1874) Art. 2, 15 pp.
- —, effect of molecular volume. *Jäger, G.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 15-.
- — —, formula. *Boltzmann, L.* Arch. Néerl. 5 (1900) 76-.
- — —, —, numerical verification. *Lagrange, C.* Brux. Ac. Bil. 16 (1888) 171-.
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- — —, influence of space occupied by molecules. *Korteweg, D. J.* [1880] A. Ps. C. 12 (1881) 136-.
- —, hydrostatic, and molecular motion of gravitation. *Grassi, G.* Mil. I. Lomb. Rd. 8 (1875) 452-.
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- —, influence in theory of gases. *Moutier, J.* [1877] Par. S. Phlm. Bil. 2 (1878) 70-.
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- —, Crookes's experiments. *Serpieri, A.* (xii) Rv. Sc.-Ind. 12 (1880) 213-; 300-.

- Radiating and absorbing bodies, motions. Zöllner, J. C. F. A. Ps. C. 160 (1877) 154-296-, 459-.
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- , —, apparatus employed in researches on. Moss, R. J. B. A. Rp. (1878) 489.
- , — at atmospheric pressure. Stoney, G. J. [1877] Dubl. S. Sc. P. 1 (1878) 53-.
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- , —, circulation of residual gaseous matter. Swinton, A. A. C. [1898] L. Ps. S. P. 16 (1899) 148-, 156-; Ph. Mg. 46 (1898) 387-, 393-.
- , —, ponderomotive force. Myškin, N. P. Vars. S. Nt. Tr. (1899) (C. R., Ps. C.) No. 1, 2-.
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- , —, experimental researches. Crookes, W. Nt. 19 (1879) 511-, 533-.
- , —, influence of residual gas. Crookes, W. [1876] R. S. P. 25 (1877) 136-.
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- — —. *Moutier, J. C. R.* 66 (1868) 344-.
- — —. *Wittwer, W. C. Z. Mth. Ps.* 14 (1869) 81-; 17 (1872) 13-.
- — —. *Puschl, K.* [1874] Wien Ak. Sb. 70 (1875) (Ab. 2) 413-.
- — — (perfect gases). *Walter, A. D. Nf. B.* (\*1877) 105-.
- — —. *Bouty, E.* Rv. Sc. 18 (1880) 967-.
- — —, dynamical problems illustrating. *Rayleigh, (Lord).* Ph. Mg. 32 (1891) 424-.
- — —, Liouville's law and the corresponding law in. *Wind, C. H.* Wien Ak. Sb. 106 (1897) (Ab. 2a) 21-.
- — —, statistical dynamics illustrated by meteor swarms and optical rays. *Larmor, J. B. A.* Rp. (1900) 632-.
- — — liquids. *Kononov, D.* Rs. Ps.-C. S. J. 18 (C.) (1886) 395-; Z. Ps. C. 1 (1887) 39-; 2 (1888) 1-.
- — —. *Stankevič, B. V.* [1889] Vars. S. Nt. Tr. (1889-90) (C. R., Ps. C.) No. 4, 3-, No. 5, 1-, No. 6, 11-.
- — — (incompletely miscible). *Fuchs, K.* Exner Rpm. 26 (1890) 664-.
- — —. *Jäger, G.* Wien Ak. Sb. 101 (1892) (Ab. 2a) 920-.
- — — with simple molecules. *Bakker, G. J. de.* Ps. 6 (1897) 577-; 7 (1898) 511-.
- Thermal condition of gases. *Puschl, K.* Wien SB. 45 (Ab. 2) (1862) 357-.
- transpiration and radiometer motion. *Sutherland, W.* Ph. Mg. 42 (1896) 373-, 476-.
- — —. *Reynolds, O.* Ph. Mg. 43 (1897) 142-.
- — —. *Sutherland, W.* Ph. Mg. 44 (1897) 52-.
- Thermodynamic potential, kinetic interpretation. *Waals, J. D. van der.* Amst. Ak. Vs. 8 (1895) 205-; Arch. Néerl. 30 (1897) 187-.
- Thermodynamic surface of water. *Goldhammer, D. A.* Mosc. Un. Mm. (Ps.-Mth.) 6 (1885) 1-.
- Thermodynamics, second law, demonstration from mechanical principles. *Michelson, V. A.* Rec. Mth. (Moscou) 13 (1896) 229-.
- — —, and kinetic theory of gases. *Burbury, S. H.* Ph. Mg. 1 (1876) 61-.
- Transformation of state of bodies, new theory. *Moulin, H.* Par. S. Ps. Sé. (1896) 45-, 268-.
- Transition layer between liquid and vapour. *Waals, J. D. van der.* [1888] Amst. Ak. Vs. M. 5 (1889) 171-; Fsch. Ps. (1888) (Ab. 2) 331-.
- Vacuum, nature of so-called. *Preston, S. T.* Ph. Mg. 4 (1877) 110-.
- — —. *Stoney, G. J.* Ph. Mg. 4 (1877) 222-.
- Velocities of gases. *Mott, A. J.* [1881] Lpool. Lt. Ph. S. P. 36 (1882) 81-.
- Velocity of gases, limiting. *Pirogov, N. N.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 93-, 295-; Fsch. Ps. (1886) (Ab. 2) 238-.
- — —, — (Pirogov). *Stankevič, B. V.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 32-.
- — —, — (Stankevič). *Pirogov, N. N.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 133-.
- — —, molecular. *Brusotti, F.* Mil. I. Lomb. Rd. 5 (1872) 754-.
- — —, —. *Violi, A.* Rm. R. Ac. Linc. T. 8 (1884) 22-, 62-.
- — —, —, and velocity of sound. *Brusotti, F.* Mil. I. Lomb. Rd. 10 (1877) 209-.
- — — liquids, molecular. *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 2) 254-.
- — —, mean, of molecules of imperfect gases. *Blaserna, P. C. R.* 69 (1869) 134-.
- — —, molecular. *Wächter, F.* Lieb. A. 191 (1878) 309-; 192 (1878) 256.
- — —. *Jäger, G.* Wien Ak. Sb. 99 (1891) (Ab. 2a) 860-.
- — —, and temperature. *Juppont, —.* Toul. Ac. Sc. Bll. 1 (1898) 117-.
- — — of reacting gas molecules. *Cantor, M.* A. Ps. C. 62 (1897) 482-.
- — —, total molecular, of body, results of calculation. *Sandrucci, A.* Rv. Sc.-Ind. 18 (1886) 217-, 267-.

## VIRIAL.

- Clausius, R.* Bonn Sb. Niedr. Gs. (1870) 114-; C. R. 70 (1870) 1314-.
- Cerruti, V.* Nap. Rd. 15 (\*1876) 154-; As. Fr. C. R. 5 (1876) 122-.
- Pirogov, N. N.* Rs. Ps.-C. S. J. 20 (Ps.) (1888) 1-; 21 (Ps.) (1889) 219-; 23 (Ps.) (1891) 127-; Fsch. Ps. (1889) (Ab. 2) 207-; (1891) (Ab. 2) 248; Z. Mth. Ps. 37 (1892) 257-.
- application to kinetic theory of gases. *Lorentz, H. A.* A. Ps. C. 12 (1881) 127-, 660-.
- — —. *Eddy, H. T.* Franklin I. J. 85 (1883) 339-, 409-.
- — —. *Sonin, N. J.* [1889] Vars. S. Nt. Tr. (1889-90) (C. R., Ps. C.) No. 7, 1-; Fsch. Ps. (1890) (Ab. 2) 247-.
- case. *Clausius, R.* C. B. 78 (1874) 1731-.

- of Clausius. *Combescura, É.* [1869] *Mntp. Mm. Ac. Sect. Sc.* 7 (1867-71) 418-.
- — — *Lucas, F.* *C. R.* 79 (1874) 103-.
- — — *Basevi, C. E.* *Nt.* 52 (1895) 413-.
- — — *Gray, A.* *Nt.* 52 (1895) 568.
- — — *Burbury, S. H.* *Nt.* 52 (1895) 568.
- — — *Baynes, R. E.* *Nt.* 52 (1895) 569.
- — — and new theorem. *Yvon-Villarceau, A.* *C. R.* 75 (1872) 282-, 377-, 990-.
- equation. *Clausius, R.* *C. R.* 75 (1872) 912-.
- $\frac{1}{2}m \frac{d^2r^2}{dt^2} = mv^2 + (Xx + Yy + Zz).$  *Mantel, W. N.* *Arch. Wiak.* 18 (1891) 127-.
- , complete. *Grinwis, C. H. C.* *Amst. Ak. Vs. M.* 1 (1886) 19-; *Arch. Néerl.* 19 (1884) 461-.
- for gases and vapours. *Tait, P. G.* *Nt.* 45 (1892) 199-.
- , van der Waals's treatment of Laplace's pressure in. *Rayleigh, (Lord).* *Nt.* 44 (1891) 499.
- — — — — *Tait, P. G.* *Nt.* 44 (1891) 546-.
- — — — — *Rayleigh, (Lord).* *Nt.* 44 (1891) 597.
- — — — — *Tait, P. G.* *Nt.* 44 (1891) 627-.
- equations and Clausius. *Kool, C. J.* *Laus. S. Vd. Bil.* 28 (1892) 87-.
- forms, various. *Clausius, R.* *A. Ps. C.* (*Jubelbd.*) (1874) 411-.
- and internal pressure in fluids. *Amagat, E. H.* *C. R.* 120 (1895) 489-, 580.
- of system of hard colliding bodies. *Rayleigh, (Lord).* *Nt.* 45 (1892) 80-.
- theorem, analogue to. *Rayleigh, (Lord).* *Ph. Mg.* 50 (1900) 210-.
- in thermodynamics. *Herschel, A. S.* *Nt.* 18 (1878) 39-, 142.
- — — — —
- Volatile bodies, motion of particles. *Bodaszewski, E. J.* (*xii*) *Kosmos (Lw.)* 6 (1881) 49; 7 (1882) 177-.
- 0250 Absorption and Adsorption of Gases.**
- (For Moser's Images, Thermography, see 4225.)
- Absorbent powers of earths. *Leslie, John. Nicholson J.* 4 (1801) 196-.
- Absorption of air by bodies. *Rhuland, —.* *J. de Ps.* 84 (1817) 88-.
- — — gases by caoutchouc. *Hüfner, G. A.* *Ps. C.* 34 (1888) 1-.
- — — — — *Kayser, H.* *A. Ps. C.* 43 (1891) 544-.
- — — — charcoal. *Hasselt, A. van.* (*xii*) *Mbl. Nt.* 6 (1876) 111-.
- — — — — *Smith, R. A.* *R. S. P.* 28 (1879) 822-.
- — — — glass. *Gáspár, J.* *Orv.-Termt. Éts. (Termt. Szak)* (1886) 51-.
- Absorption of gases in liquids at different temperatures. *Bohr, C. A.* *Ps. C.* 62 (1897) 644-.
- — —, and temperature. *Müller-Erbach, W.* *Exner Rpm.* 22 (1886) 538-.
- — — water vapour by solids. *Ihmori, T. A.* *Ps. C.* 31 (1887) 1006-.
- — — — solutions. *Guglielmo, G.* *Tor. Ac. Sc. At.* 17 (1881) 54-.
- Adhesion of air, to water vapour in particular. *Volz, W. L.* *Pogg. A.* 17 (1829) 89-.
- — — gases to substances. *Töppler, A.* *Riga Cor.-Bl.* 15 (1866) 42-.
- — — — surface of solids. *Matteucci, C.* *C. R.* 64 (1867) 74-.
- Absorbed air layer on glass surfaces, thickness. *Schumann, O.* *A. Ps. C.* 27 (1886) 91-.
- Adsorption of gases by powdered glass. *Müller-farth, P.* *A. Ps.* 3 (1900) 328-.
- , variation with thickness of layer. *Müller-Erbach, W.* *A. Ps. C.* 28 (1886) 684-; *Wien Ak. Sb.* 98 (1890) (*Ab. 2a*) 327-; *Exner Rpm.* 25 (1889) 565-; *D. Nf. Vh.* (1894) (*Th. 2, Hälfte 1*) 70-; *Wien Ak. Sb.* 105 (1896) (*Ab. 2a*) 263-.
- Condensation of air on glass surfaces. *Dibbits, H. C.* (*xii*) *Mbl. Nt.* 7 (1877) 91-.
- — — — — *Voigt, W.* *A. Ps. C.* 19 (1883) 39-.
- — — carbon dioxide on glass surfaces. *Bunsen, R. W.* *A. Ps. C.* 20 (1883) 545-.
- — — — — *Kayser, H.* *A. Ps. C.* 21 (1884) 495-.
- — — — — *Bunsen, R. W.* *A. Ps. C.* 22 (1884) 145-.
- — — — — *Krause, H.* *A. Ps. C.* 36 (1889) 923-.
- — — — —, and diffusion through layers of grease. *Kayser, H.* *A. Ps. C.* 23 (1884) 416-.
- — — compressed carbon dioxide on glass under action of light. *Pfaundler, L.* *A. Ps. C.* 24 (1885) 493-.
- — — gases on glass surfaces. *Chappuis, P.* *A. Ps. C.* 8 (1879) 1-, 671-.
- — — — — *Bottomley, J. T.* *R. S. P.* 38 (1885) 158-.
- — — — — smooth bodies. *Magnus, G.* *Berl. B.* (1853) 378-.
- — — — — solids. *Bertrand, A., & Jamin, —.* *C. R.* 36 (1853) 994-.
- — — — — *Weber, F.* *Halle Z. Nw.* 40 (1872) 189-.
- — — — — and heat thereby disengaged. *Favre, P. A.* *C. R.* 39 (1854) 729-.
- — — — — surfaces. *Kayser, H.* *Berl. Ps. Gs. Vh.* (1885) 44-.
- — — — — and vapours on solids. *Quincke, G.* *Pogg. A.* 106 (1859) 326-.
- — — vapours on solids. *Magnus, G.* *A. Ps. C.* 121 (1864) 174-.
- Gases contained in steel. *Anon.* *Oestr. Z. Brgw.* 32 (1884) 387-, 409-, 424-.
- , permanent, fixed by moist glass surfaces. *Mehlhorn, F.* *Berl. Ps. Gs. Vh.* (1898) 123-.
- Occlusion of gases by coke. *Storer, F. H., & Lewis, D. S.* *Am. C. J.* 4 (1882-83) 409-.
- — — — — metallic oxides. *Richards, T. W., & Rogers, E. F.* *Am. Ac. P.* 28 (1893) 200-.

## 0250 Occlusion of Gases

- Occlusion of gases by metals. *Odling, W.* [1867] R. I. P. 5 (1869) 159-.
- — — — — *Bose, E.* Z. Ps. C. 34 (1900) 701-.
- — — — — platinum black. *Mond, L., Ramsay, W., & Shields, J.* Phil. Trans. (A) 190 (1898) 129-.
- — — — — hydrogen by iron. *Bellati, M., & Lussana, S.* Ven. I. At. (1888-89) 1821-.
- — — — — metals. *Graham, T.* R. S. P. 16 (1868) 422-; C. R. 66 (1868) 1014-.
- — — — — meteoric iron. *Graham, T.* R. S. P. 15 (1867) 502-; C. R. 64 (1867) 1067-.
- — — — — nickel, resistance of nickel. *Bellati, M., & Lussana, S.* Ven. I. At. (1887-88) 1567-.
- — — — — and oxygen by palladium. *Mond, L., Ramsay, W., & Shields, J.* Phil. Trans. (A) 191 (1898) 105-.
- — — — — platinum black. *Mond, L., Ramsay, W., & Shields, J.* Phil. Trans. (A) 186 (1896) 657-.
- — — — — phenomena. *Schutzenberger, P.* C. R. 98 (1884) 1520-.

## 0300 Capillarity. (See also Chemistry 7165.)

(For Spheroidal State see 1840.)

- Leslie, John.* Tilloch Ph. Mg. 14 (1802) 193-.
- Milon, —.* J. de Ps. 54 (1802) 128-.
- Örsted, H. C.* Kiøb. Ov. (1819-20) 12-.
- Poisson, S. D.* Magendie J. de Pl. 6 (1826) 361-.
- Emmett, J. B.* Ph. Mg. 1 (1827) 115-, 332-.
- Magnus, G.* Pogg. A. 10 (1827) 153-.
- Strong, T.* Silliman J. 18 (1830) 70-.
- Clausen, T.* Gruithuisen N. Analekt. 1 (1834) (Heft 2) 5-.
- Cooper, P.* Thomson Ro. 4 (1836) 344-.
- Örsted, H. C.* Kiøb. Ov. (1840) 22-; Erdm. J. Pr. C. 23 (1841) 472-.
- Simon, —.* C. R. 12 (1841) 892-; A. C. 32 (1851) 5-.
- Örsted, H. C.* A. C. 4 (1842) 379-.
- Mossotti, O. F.* (vi Add.) Il Cim. 4 (1846) 439-.
- Henry, J.* Am. Ph. S. P. 4 (1847) 176-.
- Desains, E.* [1852-56] C. R. 34 (1852) 765-; A. C. 51 (1857) 385-.
- Wertheim, G.* [1854] A. C. 63 (1861) 129-.
- Desains, E.* C. R. 43 (1856) 1077-.
- Zantedeschi, F.* Ven. At. (1855-56) 811-.
- Wertheim, G.* C. R. 44 (1857) 1022-.
- Osann, G.* [1858] Würzb. Vh. 9 (1859) 44-.
- Bède, É.* Brux. Mm. Cour. 4<sup>o</sup>, 30 (1861) 198 pp.
- Bashforth, F.* B. A. Rp. (1862) (pt. 2) 2-.
- Bède, É.* [1862] (vii) Brux. Mm. Cour. 4<sup>o</sup>, 32 (1865) 17 pp.; 33 (1867) 37 + 28 pp.
- Potter, R.* Camb. Ph. S. P. 1 (1866) 21-.
- Roger, É.* C. R. 62 (1866) 184-, 848-; 74 (1872) 1510-; 76 (1873) 816-.
- Tait, P. G.* Edinb. R. S. P. 5 (1866) 593-.
- Mensbrugge, G. van der.* Les Mondes 21 (1869) 302-.
- Duclaux, E.* J. de Ps. 1 (1872) 350-.
- Scholz, R.* A. Ps. C. 148 (1873) 62-.
- Tait, P. G.* [1873-75] (xi) Edinb. R. S. P. 8 (1875) 208-, 485.
- Spring, W.* Brux. Ac. Bll. 41 (1876) 914-.
- Coutance, A. G. A.* (xii) Brest S. Ac. Bll. 6 (1880) 81-.
- Edtövs, (bárá) L.* (xii) Mag. Tud. Ak. Ets. 16 (No. 2) (1882) 46.
- Riley, J. T.* Ph. Mg. 15 (1883) 191-.
- Worthington, A. M.* [1885] Birm. Ph. S. P. 5 (1885-87) 83-.
- Thomson, (Sir) W.* [1886] R. I. P. 11 (1887) 483-.
- Nasse, O.* Meckl. Vr. Nt. Arch. (1889) xvi-.
- Gossart, É.* C. R. 113 (1891) 537-.
- Briggs, J. E.* [1896] Jam. I. J. 2 (1899) 212-.
- Mensbrugge, G. van der.* [1900] Sc. Abs. 4 (1901) 355.
- Absorption of gases, capillary. *Bunsen, R. W.* A. Ps. C. 24 (1885) 321-; 25 (1885) 680.
- Action of liquid on solid at short distance. *Cintolest, F.* (xii) Rv. Sc.-Ind. 7 (1875) 219-.
- Adhesion. *Schwabe, H.* Anhalt Vh. Nt. Vr. 8 (1849) 10.
- , apparent. *Stefan, J.* Wien Ak. Sb. 69 (1874) (Ab. 2) 713-.
- experiments. *Ruhland, R. L.* Schweigger J. 11 (1814) 146-.
- , use of lamp-black in. *Geubel, H. K.* (xii) Arch. Phm. 121 (1852) 111-.
- , liquid. *Link, H. F.* Gilbert A. 24 (1806) 121-; 26 (1807) 146-.
- , —. *Tomlinson, C.* Ph. Mg. 33 (1867) 401-.
- between liquid and damp paper. *Dapples, C.* Laus. S. Vd. Bll. 15 (1878) (PV.) 91-.
- of liquids to mercury. *Gore, G.* Ph. Mg. 26 (1863) 142-.
- — — — — solids. *Bugge, T.* Dn. Vd. Selsk. Skr. 2 (1801-02) (haft 2) 57-.
- — — — —. *Luvini, G.* Tor. At. Ac. Sc. 5 (1869-70) 869-.
- — — — —, apparatus for determining. *Krebs, G.* A. Ps. C. 135 (1868) 144-.
- — molecules of water amongst themselves. *Rumford, B. (Count).* Bb. Brit. 33 (1806) 3-.
- Air pressure in barometer-vacuum, Arago's method of determining, and influence of capillarity on measurement of pressure and temperature. *Pernet, J.* Berl. Ps. Gs. Vh. (1886) 108-.
- Annulus, liquid, spontaneous segmentation. *Worthington, A. M.* [1879] R. S. P. 30 (1880) 49-.
- Archimedes' principle, capillary modification. *Mathieu, É.* J. de Ps. 3 (1884) 86-.
- — and capillary phenomena. *Moutier, J.* Par. S. Phlm. Bll. 11 (1874) 47.
- Ascent between concentric cylindrical tubes. *Verschaffelt, J.* Amst. Ak. Vs. 5 (1897) 175-; J. de Ps. 9 (1900) 64.

## Capillarity 0300

## 0300 Capillarity

## Brownian Movement or Pedesis 0300

- Ascent of ether, influence of temperature from its critical point to the boiling point of ethylene. *Vries, E. C. de.* *Amst. Ak. Vs.* [1] (1893) 156-; *Arch. Néerl.* 28 (1895) 210-.
- liquified gases. *Verschaffelt, J.* *Amst. Ak. Vs.* 4 (1896) 74-; *J. de Ps.* 6 (1897) 444-.
- liquid carbon dioxide near critical point. *Verschaffelt, J.* *Amst. Ak. Vs.* 5 (1897) 94-; *J. de Ps.* 6 (1897) 445-.
- liquids near critical point. *Eldik, A. van.* [1897] *Amst. Ak. Vs.* 6 (1898) 18-, 74-; *J. de Ps.* 7 (1898) 159-.
- in narrow spaces. *Decharme, C. J.* (xii) *M.-et-L. S. Ac. Mm.* 32 (1875) 1-; (ix) *C. R.* 80 (1875) 1261-.
- tubes. *Decharme, C. J.* [1872-73] (xii) *M.-et-L. S. Ac. Mm.* 28 (1873) 125-; (vii) *C. R.* 74 (1872) 936-; 77 (1873) 591-.
- — — — —. *Roiti, A.* (xi) *N. Cim.* 7 & 8 (1872) 181-.
- — — — —. *Mathieu, É.* *J. de Ps.* 3 (1884) 82-.
- — — — — and porous bodies. *Decharme, C. J.* [1873] (xii) *M.-et-L. S. Ac. Mm.* 30 (1874) 7-; (vii) *C. R.* 77 (1873) 998-, 1157-.
- salt solutions in tubes. *Goldstein, M. J.* *Rs. Ps.-C. S. J.* 20 (C.) (1888) 408-; *C. S. J.* 56 (Abs.) (1889) 205-; *Z. Ps. C.* 5 (1890) 233-.
- solutions in tubes. *Goldstein, M., & Damskij, A.* *Rs. Ps.-C. S. J.* 16 (C.) (1884) 642-; *C. S. J.* 48 (1885) 115-.
- — — — —, relation to their concentration. *Kazankin, N.* *Rs. Ps.-C. S. J.* 23 (Ps.) (1891) 122-; *J. de Ps.* 1 (1892) 133.
- water and alcohol, experiments. *Noack, K.* *Giessen Oberh. Gs. B.* 19 (1880) 118-.
- depression of mercury in tubes. *Bede, É.* [1852] *Brux. Mm. Cour.* 4°, 25 (1851-53) 25 pp.
- in long and short tubes. *Hällström, G. G.* *Gilbert A.* 14 (1803) 425-.
- between 2 parallel plates. *Desains, E. C. R.* 45 (1857) 225-.
- parallel plates, agreement of theory and experiment. *Quet, —.* *C. R.* 98 (1884) 87-.
- Attraction, apparent, between wetted solids. *Girard, P. S.* *A. C.* 29 (1825) 260-.
- molecular, in capillary spaces. *Bequerel, A. C.* *C. R.* 76 (1873) 1037-.
- , of liquids upon one another. *Volkman, P. A.* *Ps. C.* 16 (1882) 321-.
- , —, and motion of liquids. *Belli, G.* *Brugnatelli G.* 2 (1819) 232-.
- between 2 parallel plates. *Preobraženskij, P. V.* [1894] *Rec. Mth. (Moscou)* 17 (1895) 494-; *Fachr. Ps.* (1895) (Ab. 1) 434.
- and repulsion. *Percival, T.* [1784] *Manch. Ph. S. Mm.* 2 (1789) 429-.
- — — — —. *Wall, M.* [1785] *Manch. Ph. S. Mm.* 2 (1789) 455-.
- — — — —. [Bennet, A. non] *Percival, T.* [1786] *Manch. Ph. S. Mm.* 3 (1790) 116-.
- — — — —, apparent, between bodies floating on or immersed in liquids. *Monge, G.* *Nicholson J.* 3 (1800) 269-.
- Attraction and repulsion of 2 bodies dipping in liquid. *Oberbeck, A.* *Halle Nf. Gs. B.* (1880) 17-.
- of surfaces. *Carradori, G.* [1808] *Mod. Mm. S. It.* 12 (1805) (pte. 2) 89-; 15 (1811) 126-.
- — — or adhesion. *Carradori, G.* (vi *Adds.*) *A. C.* 35 (1800) 87-; (i) *Mod. Mm. S. It.* 11 (1804) 75-.
- — — not to be confounded with adhesion of capillary tubes. *Carradori, G.* *Brugnatelli G.* 3 (1810) 373-.
- — —, may it be considered a repulsion? *Carradori, G.* *Brugnatelli G.* 8 (1815) 116-.
- Attractions and repulsions. *Kurz, A.* *Exner Rpm.* 21 (1885) 518-; 27 (1891) 60-.
- — —, apparent, between suspended particles. *Fuchs, C.* *Exner Rpm.* 25 (1889) 735-.
- — —, problem. *Marangoni, C.* *Rm. R. Ac. Linc. Rd.* 4 (1888) (Sem. 1) 339-.
- Boundary layer between 2 liquids, molecular theory. *Fuchs, K.* *Exner Rpm.* 24 (1888) 614-.
- — — — —, motion of suspended particles in. *Fuchs, K.* *Exner Rpm.* 26 (1890) 42-.
- layers, thickness. *Vincent, G.* *Par. S. Ps. Sé.* (1900) 15-; *A. C.* 19 (1900) 421-.
- Bounding surface of liquid, form. *Laroque, F.* *Toul. Mm. Ac.* 2 (1870) 377-.

## BROWNIAN MOVEMENT OR PEDESIS.

- Brown, Rbt.* *Edinb. N. Ph. J.* 5 (1828) 358-.
- Brewster, (Sir) D.* [1828] *Edinb. J. Sc.* 10 (1829) 215-.
- Brown, Rbt.* *Edinb. J. Sc.* 1 (1829) 314-.
- Muncke, G. W.* *Pogg. A.* 17 (1829) 159-.
- Marx, C. M.* *Schweigger J.* 61 (= *Jb.* 1) (1831) 121-.
- Exner, S.* *Wien Sb.* 56 (1867) (Ab. 2) 116-.
- Dancer, J. B.* *Manch. Lt. Ph. S. P.* 7 (1868) 162-.
- Budde, E.* *Bonn SB. Niedr. Gs.* 27 (1870) 108-.
- Jevons, W. S.* *Manch. Lt. Ph. S. P.* 9 (1870) 78-.
- Stodder, C. M.* *Mer. J.* 5 (1871) 81-.
- Jevons, W. S.* *J. Sc.* 8 (1878) 167-.
- Casse, —.* [1880] *Brux. S. Blg. Mor. Bll.* 6 (\*1882) xxxvi-.
- Ramsay, W.* (xii) *Bristol Nt. S. P.* 3 (1882) 299-.
- Gouy, —.* *J. de Ps.* 7 (1888) 561-.
- Cantoni, G.* *Mil. I. Lomb. Rd.* 22 (1889) 152-; *Rm. R. Ac. Linc. Rd.* 5 (1889) (Sem. 1) 137-.
- Maltézos, C.* *A. C.* 1 (1894) 559-; *C. R.* 121 (1895) 303-.
- Quincke, G.* *D. Nf. Vh.* (1898) (Th. 2, Hälfte 1) 26-.
- Exner, F. M.* *A. Ps.* 2 (1900) 843-.
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- Camphor. *Levat, —.* As. Fr. C. R. (1891) (Pt. 2) 331-.
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- , —, —, —. *Fechner, G. T.* Kastner Arch. Ntl. 9 (1826) 408-.
- , —, —, —, on water. *Prevost, B. A. C.* 21 (1797) 254-; 22 (1797) 111-; 24 (1797) 31-.
- , —, —, —, — (Prevost). *Carradori, G.* A. C. 37 (1800) 38-.
- , —, —, —, — (—). *Biot, J. B.* Par. S. Phlm. Bll. 3 (1801) 42-.
- , —, —, —, —, and mercury. *Boisgiraud, —, & Joly, —.* C. R. 12 (1841) 690-.
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- Fusiniere, A.* A. Sc. Lomb. Ven. 11 (1841) 6-.
- Nöschel, A.* (viii) Riga Cor.-Bl. 3 (1849) 20-, 33-.
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- — — — — elementary theory. *Mensbrugghe, G. van der.* *Brux. Ac. Bil.* 5 (1883) 482-.
- — — — — when vapours of volatile liquids are allowed to fall on liquid surfaces. *Dutrochet, H.* C. R. 14 (1842) 1028-; 15 (1842) 25-.
- — — — — attractive power on water. *Carradori, G.* *Tilloch Ph. Mg.* 11 (1801) 27-.
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- Powders on water. *Marangoni, C.* *Rm. R. Ac. Linc. Rd.* 4 (1898) (*Sem.* 1) 520-.
- Salts on water, gyratory movements. *Lescaeur, H.* *Par. S. C. Bil.* 24 (1875) 270-.
- Solids, gyratory movements. *Weber, R.* *Arch. Sc. Ps. Nt.* 12 (1894) 510-.
- Substance which moves on water like camphor. *Morren, C. F. A.* *Quetelet Cor. Mth.* 10 (1838) 339-.
- Wicks, small lighted, on oil. *Wilson, P.* [1795] *Edinb. B. S. T.* 4 (1798) 163-.
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- — — — — (Prevost). *Carradori, G.* A. C. 48 (1803) 197-.
- — — — — on surface of alcoholic liquors, certain curious. *Thomson, Jas.* B. A. Rp. (1855) (*pt.* 2) 16-.
- Oil to calm seas, successful use. *Marshall, W. P.* *Midl. Ntlist.* 11 (1888) 170-, 207-.
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— *Rudberg, F.* Stockh. Ak. Hndl. (1819) 153-; (1822) 25-.

— *Réal, H. A.* Liouv. J. Mth. 7 (1881) 341-.

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— (van der Waals's). *Sutherland, W.* Z. Ps. C. 17 (1895) 536-.

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— (Molecular potential function of van der Waals.) *Bakker, G.* Amst. Ak. Vs. 8 (1900) 223-; Amst. Ak. P. 2 (1900) 163-.

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0310 *Dialysis*

## Osmosis. Osmotic Pressure

0310

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- , influence of flow of liquid, porosity of membrane, etc., on phenomena. *Wibel, F.* Hamb. Nt. Vr. Ab. 7 (Ab. 2) (1883) 57-.
- , — pressure. *Pico, V.* Rv. Sc.-Ind. 23 (1891) 185-, 253-.
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- , —. *Nagy, I.* [1885] Mag. Tud. Ak. Etk. (Termt.) 15 (1886) No. 14, 1-; Mth. Nt. B. Ung. 3 (1884-85) 66-.
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- Poynting, J. H.* Ph. Mg. 42 (1896) 289-.
- Whetham, W. C. D.* Nt. 54 (1896) 571-.
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- and analogy between solutions and gases. *Hoff, J. H. van't.* Z. Ps. C. 1 (1887) 481-.
- of blood. *Eijkman, C.* Virch. Arch. 143 (1896) 448-.
- causes, and simplicity of laws of dilute solutions. *Sutherland, W.* Ph. Mg. 44 (1897) 493-.
- in cells of leaves. *Dixon, H. H.* [1896] Ir. Ac. P. 4 (1896-98) 61-.
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- of concentrated solutions. *Ewan, T.* Z. Ps. C. 31 (1899) 22-.
- and contraction coefficient of saline solutions. *Monti, V.* Rv. Sc.-Ind. 25 (1893) 122-.
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- — — and electric conductivity. *Reicher, L. T.* Mbl. Nt. (1888) 108-.
- — — of solutions. *Dieterici, C.* A. Ps. C. 52 (1894) 263-.
- heat of solution, theory. *Dieterici, C.* A. Ps. C. 45 (1892) 207-, 589-.
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 — — red corpuscles, and isotonic coefficients. *Hamburger*, H. J. Amst. Ak. Vs. M. 7 (1890) 15-  
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 — —, nature. *Mijers*, J. Rec. Tr. C. P.-Bas 17 (1898) 177-  
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- , *Nernst, W.* Z. Ps. C. 2 (1888) 613-.
- , *Bose, E.* Z. Ps. C. 29 (1899) 658-.
- , *Wiedeburg, O.* Z. Ps. C. 30 (1899) 586-.

## DIFFUSION OF GASES.

- Dalton, J.* [1803] Manch. Ph. S. Mm. 1 (1805) 259-.
- Onion, W.* Chemist 5 (1844) 112-.
- Thomson, T. S.* Ph. Mg. 25 (1844) 51-; 27 (1845) 346-; (vi Adda.) 25 (1844) 282-.
- Broek, J. H. van den.* Utr. Scheik. Oz. 5 (1851) 489-.
- Lang, V. von.* Wien Sb. 63 (1871) (Ab. 2) 604-.
- Wróblewski, Z.* (xii) Kosmos (Lw.) 3 (1878) 8-.
- Moutier, J.* Par. S. Phm. Bil. 5 (1891) 136-.
- Boltzmann, L.* [1882-83] Wien Ak. Sb. 86 (1883) (Ab. 2) 63-; 88 (1884) (Ab. 2) 835-.
- Waitz, K.* A. Ps. C. 17 (1882) 201-, 351-.
- Gross, G.* [1889] A. Ps. C. 40 (1890) 424-.
- Toepler, M.* A. Ps. C. 58 (1896) 599-.
- Brillouin, M.* [1899-1900] A. C. 18 (1899) 433-; Sc. Abs. 4 (1901) 380-.
- Air and carbon dioxide, variability of coefficient of diffusion between. *Hausmaninger, V.* Wien Ak. Sb. 86 (1883) (Ab. 2) 1073-.
- , diffusion through water. *Barus, C.* Am. J. Sc. 9 (1900) 397-.
- , moist and dry, diffusion between. *Dufour, L.* C. R. 78 (1874) 961-; Laus. S. Vd. Bil. 13 (1874-75) 165-, 608-.
- , —, —, —, —. *Reusch, F. E. von.* A. Ps. C. 152 (1874) 865-.
- , —, —, — (Dufour). *Kundt, A.* A. Ps. C. 2 (1877) 17-.
- , passage of one kind into another through interposing substances. *Priestley, J.* Am. Ph. S. T. 5 (1802) 14-.
- , — through porous bodies with very small pressure differences. *Christiani, A.* Arch. An. Pl. (Pl. Ab.) (1882) 112-.
- Apparatus for demonstration. *Dvorák, V.* Nt. 48 (1893) 79-.
- , —. *McLeod, H.* Nt. 48 (1893) 104-.

## Diffusion of Gases 0320

- Atmolytic action of membrane of hen's eggs. *Rodendorf, A. A.* Rs. Ps.-C. S. J. 31 (C.) (1899) 482-; C. Ztg. 23 (1899) 658-.
- flow of gases. *Christiansen, C. A.* Ps. C. 41 (1890) 565-.
- Building materials, porosity. *Märcker, M.* A. Lndw. 58 (1871) 65-.
- , —. *Lang, C.* Z. Bl. 11 (1875) 313-.
- Caoutchouc, permeability to gases. *Peyron, —.* C. R. 13 (1841) 820-.
- , porosity, dialysis of gas. *Payen, A.* C. R. 63 (1866) 533-.
- Carbon dioxide, diffusion through liquids. *Stefan, J.* Wien Ak. Sb. 77 (1878) (Ab. 2) 371-.
- , — — porous walls. Permeability of building materials for gases. *Maercker, M. H.* (xii) Lndw. Jb. 6 (1877) (Suppl. 1) 1-.
- Carbonic oxide, passage through cast iron stoves. *Coulier, —.* J. Phm. 8 (1868) 246-.
- Cement pores, laws of flow of gases through, uses in conduction of coal gas. *Viard, —.* [1851] A. C. 43 (1855) 314-, 482-.
- Coefficients, dependence on temperature. *Obermayer, A. von.* Wien Ak. Sb. 81 (1890) (Ab. 2) 1102-.
- , gases in water. *Hüfner, G.* A. Ps. C. 60 (1897) 134-.
- Colloidal membranes, passage of gases through. *Barthélemy, A.* C. R. 77 (1873) 427-.
- Constants, gases in liquids, dependence on viscosity of liquid. *Wróblewski, S. von.* [1878] A. Ps. C. 7 (1879) 11-.
- Dialysis and absorption of gases by colloid septa. *Graham, T.* Phil. Trans. 156 (1866) 399-.
- Diffusion through absorbing substances. *Wróblewski, S. von.* A. Ps. C. 158 (1876) 539-.
- , — —. *Karlovezky, G.* Term. Közl. 18 (1886) 369-, 409-.
- , — caoutchouc. *Aronstein, L., & Sirks, —.* Z. C. 2 (1866) 260-.
- , — —. *Kayser, H.* A. Ps. C. 43 (1891) 544-.
- , — —. *Arsonval, — d'.* C. R. 128 (1899) 1545-.
- , — gelatin. *Hagenbach, A.* A. Ps. C. 65 (1893) 673-.
- , — homogeneous solids. *Sainte-Claire Deville, [H. non] C. J.* C. R. 59 (1864) 102-.
- , — hydrophane of Czernowitza. *Hüfner, C. G.* A. Ps. C. 16 (1882) 253-.
- , — liquid films. *Pranghe, J.* A. Ps. C. Beibl. 2 (1878) 202-.
- , — in liquid, viscous and solid substances, laws. *Wróblewski, Z.* (xii) Kosmos (Lw.) 3 (1878) 95-, 151-, 199-, 247-; (xi) A. Ps. C. 2 (1877) 481-.
- , — and occlusion of gases. *Carteighe, M.* Phm. J. 3 (1873) 870-.
- , — through porous bodies. *Matteucci, C.* C. R. 57 (1863) 251-.
- , — without porous partition. *Loschmidt, J.* Wien Sb. 61 (1870) (Ab. 2) 367-; 62 (1870) (Ab. 2) 468-.

## 0320 Diffusion of Gases

- Diffusion through porous partition. *Hansemann, G.* A. Ps. C. 21 (1884) 545-.
- — — —, theory. *Kirchhoff, G.* A. Ps. C. 21 (1884) 563-.
- and pressure of gases. *Bloxam, J. C.* Br. Met. S. P. 2 (1865) 871-.
- , — question whether glass is impenetrable for gases. *Quincke, G. H.* A. Ps. C. 160 (1877) 118-.
- — separation of gases. *Graham, T. QJ.* So. (1829) (Pt. 2) 74-.
- through walls of soap bubbles. *Müller, F. C. G.* Berl. B. 7 (1874) 1401-, 1762-; *Osnab. Jbr.* 2 (1875) 19-.
- — water and agar jelly. *Hüfner, G. Z.* Ps. C. 27 (1898) 227-.
- Dynamical theory. *Stefan, J.* Wien Sb. 65 (1872) (Ab. 2) 323-.
- Effect on temperature. *Dufour, L.* [1873] (ix) Laus. S. Vd. Bll. 12 (1874) 349-.
- Experiment, lecture-. *Winkelmann, A.* A. Ps. C. 27 (1886) 479-.
- , —. *Biltz, H.* Z. Ps. C. 9 (1892) 152-.
- , —. *Kirkland, J. B.* Aust. As. Rp. (1892) 265-.
- , —. *Cundall, J. T.* [1896] C. S. P. 14 (1899) 40-, xxxv.
- Experiments. *Benigar, J.* Wien Sb. 62 (1870) (Ab. 2) 687-.
- *Obermayer, A. von.* Wien Ak. Sb. 85 (1882) (Ab. 2) 147-, 748-; 87 (1883) (Ab. 2) 188-; 96 (1888) (Ab. 2) 546-.
- Graham's discoveries. *Odling, W.* [1867] R. I. P. 5 (1869) 12-.
- Hydrogen, passage through iron. *Bellati, M., & Lussana, S.* Ven. I. At. (1889-90) 1178-; (1890-91) 987-.
- , — palladium septum. *Ramsay, W. L.* Ps. S. P. 13 (1895) 172-; Ph. Mg. 38 (1894) 206-.
- , — solid bodies. *Louyet, P.* Brux. Ac. Bll. 15 (1848) (pte. 2) 297-.
- Law. *Graham, T.* [1831] Edinb. R. S. T. 12 (1834) 222-.
- *Howorth, H. H.* [1874] Manch. Lt. Ph. S. P. 14 (1875) 51-.
- , *Graham's.* *Thomson, T. S.* Ph. Mg. 4 (1834) 321-.
- , —. *Boussinesq, J.* C. R. 67 (1868) 319-.
- , —, consequences. *Poggendorff, J. C.* Pogg. A. 28 (1833) 347-.
- Method of investigation, new. *Lang, V. von.* Wien Sb. 61 (1870) (Ab. 2) 288-.
- Migration and siphoning of gases. *Bellamy, F.* C. R. 83 (1876) 669-.
- Mixed gases. *Wretschko, A.* Wien Sb. 62 (1870) (Ab. 2) 575-.
- , —, molecular motion. *Thomsen, J. D. C.* Gs. B. 4 (1871) 595-.
- Molecular mobility of gases. *Graham, T.* Phil. Trans. (1863) 385-; C. R. 57 (1863) 181-.
- Movement engendered by diffusion. *Sainte-Claire Deville, E. H.* C. R. 90 (1880) 18-.
- Movements of gases under influence of gravity. *Wanklyn, J. A.* Ph. Mg. 22 (1861) 211-.
- Penetration of gases. *Mitchell, J. K.* Am. J. Md. Sc. 13 (1833) 100-.

## Diffusion of Gases and Liquids 0320

- Penetration into red-hot earthenware pipes. *Lauwerenburgh, A., Deimann, —, Troostwyk, — van, & Vrolik, —.* Scherer J. C. 4 (1800) 1-.
- Penetrativeness of gases and liquids. *Mitchell, J. K.* Am. J. Md. Sc. 7 (1830) 36-.
- Perfectly elastic gases of constant temperature, diffusion in space. *Meissel, E.* [1872] Arch. Mth. Ps. 55 (1873) 225-.
- Physics of smell. (Presidential address, Math. and Phys. Sect.) *Ayrton, W. E.* B. A. Rp. (1898) 767-.
- Platinum, hot, diffusion of hydrogen through. *Sainte-Claire Deville, H., & Troost, L. C.* R. 56 (1863) 977-.
- , permeation by gases. *Randall, W. W.* Am. C. J. 19 (1897) 682-.
- Poroscope. *Christiani, A.* (xii) Berl. Ps. Gs. Vh. 1 (1882) 10-.
- Rapid diffusion, case. *Pettenkofer, M. von.* Münch. Sb. (1872) 263-.
- Separation of gases by diffusion, theoretical considerations. *Rayleigh, (Lord).* Ph. Mg. 42 (1896) 493-.
- Thermodiffusion, gaseous. *Merget, A. C. R.* 78 (1874) 884-.
- , — (Merget). *Kundt, A.* A. Ps. C. 2 (1877) 17-.
- , —, in cast-iron. *Merget, A.* As. Fr. C. R. (1877) 311-.
- , —, experiments. *Merget, A.* [1879] Bordeaux S. Sc. Mm. 3 (1890) xxviii-.
- , —, of moist pulverulent bodies. *Merget, A.* As. Fr. C. R. (1875) 354-.
- , —, new observation. *Merget, A.* [1877] Lyon S. Ag. A. 10 (1878) xl-.
- Vapour, mercury. *Merget, A.* [1879] Bordeaux S. Sc. Mm. 3 (1890) xix-.
- Vapours, diffusion through porous cells. *Puluj, J.* Wien Ak. Sb. 75 (1877) (Ab. 2) 401-, 639-.
- and gases. *Winkelmann, A.* A. Ps. C. 22 (1884) 1-, 152-.
- Walls of vessels, influence on movement and composition of gases which penetrate them. *Sainte-Claire Deville, H. C. R.* 52 (1861) 524-.
- Water vapour in atmosphere. *Jungk, C. G.* A. Ps. C. 130 (1867) 1-.
- — — —. *Boltshauser, G. A.* Catania At. Ac. Gioen. 5 (1871) 157-.
- , —, diffusion coefficient in air, hydrogen and carbon dioxide. *Guglielmo, G.* Tor. Ac. Sc. At. 18 (1882) 93-.
- , —, imperviousness of valves of air-pump to. *Laspeyres, E. A. H.* A. Ps. C. 2 (1877) 478-.
- Work produced by diffusion, apparatus to illustrate. *Woodward, C. J.* L. Ps. S. P. 5 (1884) 317-; Ph. Mg. 16 (1883) 375-.

## DIFFUSION OF LIQUIDS.

- Graham, T.* [1849] Phil. Trans. (1850) 1-, 805-; (1851) 483-.
- Beilstein, F.* Lieb. A. 99 (1856) 165-.
- (*Beilstein.*) *Fick, A.* Lieb. A. 102 (1857) 97-.

- Voit, E. A. Ps. C. 180 (1867) 227-, 893-.  
 May, J. Carl Rpm. 11 (1875) 185-.  
 Johannisjanz, A. [1876] A. Ps. C. 2 (1877) 24-.  
 Stefan, J. [1878-79] Wien Ak. Sb. 78 (1879) (Ab. 2) 957-; 79 (1879) (Ab. 2) 161-.  
 Weber, H. F. Zür. Vjschr. 23 (1878) 325-.  
 Long, J. H. [1879] Ph. Mg. 9 (1880) 318-, 413-.  
 Coleman, J. J. Glasg. Ph. S. P. 18 (1887) 196-; Ph. Mg. 23 (1887) 1-.  
 Gabriel, S. C. Ztg. 11 (1887) 476.  
 Wiedeburg, O. A. Ps. C. 41 (1890) 675-.  
 Albuminous liquids in contact with distilled water. Commaille, A. Mm. Md. Mil. 27 (1871) 467-.  
 Apparatus. Coleman, J. J. Edinb. R. S. P. 14 (1888) 374-; 15 (1889) 249-.  
 Application to analysis. Graham, T. C. R. 53 (1861) 275-; Phil. Trans. (1861) 183-.  
 — of photometry. Wróblewski, Z. (xii) Krk. Ak. (Mt.-Prz.) Rz. & Sp. 8 (1861) 154-, xxxix-; (xi) A. Ps. C. 13 (1881) 606-.  
 Coefficient of sodium chloride. Marini, L. Rm. B. Ac. Linc. Rd. 4 (1895) (Sem. 2) 135-.  
 Coefficients, determination. Niemöller, F. A. Ps. C. 47 (1892) 694-.  
 —, solvents other than water, temperature variation. Heen, P. de. Brux. Ac. Bll. 19 (1890) 197-.  
 Constants, estimation for salt solution into pure solvents. Simmler, R. T., & Wild, H. Pogg. A. 100 (1857) 217-, 660.  
 Diffusion through cracks in glass. Fischer, N. W. Pogg. A. 10 (1827) 481-.  
 — in cylindrical vessels. Beez, R. Z. Mth. Ps. 10 (1865) 356-.  
 — equilibrium of salt solution not at uniform temperature. Horstmann, A. [1879] Heidl. Nt. Md. Vh. 2 (1880) 313-.  
 — figures. Martini, T. [1877-89] Nt. 17 (1878) 87-; (xii) Rv. Sc.-Ind. 10 (1878) 24-; (x) N. Cim. 9 (1881) 156-; Ven. I. At. (1888-89) 823-.  
 — of liquids and absorption by solids. Cantoni, G. Mil. I. Lomb. Rd. 1 (1864) 183-.  
 — through membranes. Schumacher, W. Pogg. A. 110 (1860) 337-.  
 — and osmosis. Krzysinski, S. Jena. Sb. (1884) 22-.  
 — through porous diaphragms. Brücke, E. Pogg. A. 58 (1843) 77-.  
 Electric phenomena. Gerich, A. (xii) N. Rs. S. Nt. Mm. 8 (No. 1) (1882) 35 pp.  
 Experiment, lecture. Vries, H. de. [1884] Mbl. Nt. (1882-84) 118-; Arch. Néerl. 20 (1886) 36-.  
 —, remarkable. Börnstein, R. Berl. Ps. Gs. Vh. (1888) 9-.  
 Fresh water, diffusion into sea water. Thoulet, J. C. R. 112 (1891) 1068-.  
 Law. Vernon, H. M. C. N. 62 (1890) 275-.  
 —, and new diffusionmeters. Umov, N. Rs. Pa.-C. S. J. 23 (Ps.) (1891) 835-.  
 Mercury, passage through lead. Henry, J. [1839] Am. Ph. S. P. 1 (1840) 82-.  
 Metals and alloys, solution and diffusion in mercury. Humphreys, W. J. C. S. J. 69 (1896) 1679-.  
 — in mercury, diffusion constants. Meyer, G. A. Ps. C. 61 (1897) 225-; 64 (1898) 752-.  
 — — —, — and solution. Humphreys, W. J. C. S. J. 69 (1896) 243-.  
 — — —, — — — (Humphreys). Roberts-Austen, —. C. S. P. 12 (1897) 219-.  
 Microhydrophorus (instrument for transfusion experiments, etc.). Gregorio, A. de. [1892] Palermo Ac. At. 3 (1895) (Sc. Nt.) 48 (ter)-.  
 Molecular diffusion. Chevrier, G. (xii) Metz Ac. Mm. 49 (Pt. 2) (1869) 207-.  
 — force, influence. Wróblewski, Z. [1881] (xii) Krk. Ak. (Mt.-Prz.) Rz. & Sp. 9 (1882) 245-, xvii-.  
 Movement engendered by diffusion. Sainte-Claire Deville, E. H. C. R. 90 (1880) 18-.  
 Organic and inorganic compounds. Scheffer, J. D. R. [1881-83] Amst. Ak. Vs. M. 17 (1882) 312-; 19 (1884) 89-; Arch. Néerl. 18 (1883) 325-.  
 Penetrativeness of gases and liquids. Mitchell, J. K. Am. J. Md. Sc. 7 (1830) 36-.  
 Salts, acid solutions of mixtures of, experiments. Hinteregger, F. Berl. B. 12 (1879) 1619-.  
 —, diffusion during evaporation of solutions. Fusinieri, A. A. Sc. Lomb. Ven. 6 (1836) 241-.  
 — in solution. Long, J. H. [1879] A. Ps. C. 9 (1880) 613-.  
 — — —. Schuhmeister, J. Wien Ak. Sb. 79 (1879) (Ab. 2) 603-.  
 — — —. Enklaar, J. E. Utr. Prv. Gn. Aant. (1881) 32-.  
 — — —, coefficient of diffusion, temperature variation. Heen, P. de. Brux. Ac. Bll. 8 (1884) 219-.  
 — — —, diffusion, regularity. Sachse, R. C. CB. 5 (1874) 237-.  
 — — —, simultaneous. Marignac, J. C. G. de. C. R. 78 (1874) 1523-; Arch. Sc. Pa. Nt. 50 (1874) 89-.  
 — — —, — in water. Beez, —. Schölmilch Z. 4 (1859) 212-; 7 (1862) 327-.  
 Solutions, aqueous. Scheffer, J. D. R. Z. Ps. C. 2 (1883) 390-.  
 —, —. Arrhenius, S. Sk. Nt. F. (1892) 358-.  
 —, dilute, effect of initial concentration. Kawalki, W. A. Ps. C. 59 (1896) 637-.  
 — of unequal temperature. Ludwig, C. Wien SB. 20 (1856) 539.  
 —, viscous. Eckhard, C. (vi Add.) Btr. An. Pl. 3 (1863) 51-.  
 Substances in solution. Abegg, R. Stockh. Öfv. (1892) 517-.  
 — — —. Arrhenius, S. [1892] Stockh. Ak. Hndl. Bh. 18 (Afd. 1) (1893) No. 8, 52 pp.; Z. Ps. C. 10 (1892) 51-.  
 — — —. Wiedeburg, O. Z. Ps. C. 10 (1892) 509-.  
 — — —. Pickering, S. U. Ph. Mg. 35 (1893) 127-.

Substances in solution, apparatus for measuring diffusion. *Griffiths, A.* L. Ps. S. P. 16 (1899) 443-; Ph. Mg. 47 (1899) 530-.

Water, diffusion through indiarubber. *Lundie, R. A.* Edinb. R. S. P. 22 (1900) 258-.

## DIFFUSION OF SOLIDS.

*Colson, A.* C. R. 94 (1882) 26-.

Carbon. *Violle, J.* C. R. 94 (1882) 28-.

Gold, in solid lead. *Roberts-Austen, (Sir) W.* [1900] R. S. P. 67 (1901) 101-.

Impalpable powder, into solid body. *Marsden, R. S.* Edinb. R. S. P. 10 (1880) 712-.

Metals, inter-diffusion. *Des Coudres, T. D.* Nf. Vh. (1890) (Th. 2) 54-.

—, solid and fluid. *Roberts-Austen, W. C.* Phil. Trans. (A) 187 (1897) 383-.

—, —, fluids, properties common to. *Roberts-Austen, W. C.* [1886] R. I. P. 11 (1887) 395-.

Solids, inter-diffusion. *Colson, A.* C. R. 93 (1881) 1074-.

Sulphides, diffusion through steel. *Campbell, E. D.* Am. C. J. 18 (1896) 707-.

## EFFUSION.

of gases. *Graham, T. B. A.* Rp. (1845) (pt. 2) 28; Phil. Trans. (1846) 578-; (1849) 349-.

—, *Neyreneuf, V.* C. R. 90 (1880) 1487-; 92 (1881) 713-.

—, *Mitinskij, A. I.* Rs. Ps.-C. S. J. 30 (Ps.) (1898) 206-; J. de Ps. 9 (1900) 57.

—, laws. *Sandrucci, A.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 2) 209-.

—, lecture experiment. *Freer, P. C.* Z. Ps. C. 9 (1892) 669-.

— (air) at different pressures through different orifices and tubes. *Magrini, L.* Mil. At. I. Lomb. 1 (1858) 333-.

— through small orifice at different temperatures. *Timofejew, W.* Z. Ps. C. 6 (1890) 586-.

— — — — in thin wall. *Segnitz, E.* Pogg. A. 111 (1860) 474-.

— hydrogen. *Osann, G.* Erdm. J. Pr. C. 18 (1839) 486-.

velocities of efflux, specific heats and mean squares of velocity for gases, relations. *Franchis, G. de.* Rm. R. Ac. Linc. Rd. 1 (1885) 208-, 884.

## TRANSPIRATION.

## GASES.

*Faraday, M.* A. C. 5 (1817) 298-; QJ. Sc. 7 (1819) 106-.

*Graham, T. B. A.* Rp. (1845) (pt. 2) 28; Phil. Trans. (1846) 578-; (1849) 349-.

Air, effect of temperature. *Guthrie, Francis.* L. Ps. S. P. 2 (1879) 246-; Ph. Mg. 5 (1878) 433-.

— at different pressures, flow through granular materials. *Tufts, F. L.* [1900] N. Y. Ac. A. 13 (1900-01) 508-.

Air, velocity. *Zwaardemaker, H.* [1900] Cb. Pl. 14 (1901) 385-.

Dimensional properties of matter in gaseous state. *Reynolds, O.* [1879] Phil. Trans. 170 (1880) 727-.

Thermal transpiration. *Reynolds, O.* R. S. P. 30 (1880) 300-.

Vapours. *Meyer, L.* Berl. B. 11 (1878) 206-; A. Ps. C. 7 (1879) 497-.

—, *Meyer, L., & Schumann, O.* Berl. B. 14 (1881) 593-; A. Ps. C. 13 (1881) 1-.

—, *Stuedel, V.* A. Ps. C. 16 (1882) 369-.

—, *Meyer, L.* A. Ps. C. 16 (1882) 394-.

## LIQUIDS.

*Girard, P. S.* Par. Mm. de l'I. (1813-15) 249-; Par. Mm. Ac. Sc. 1 (1816) 187-, 260-.

*Lehot, C. J.* Gilbert A. 65 (1820) 64-.

*Poiseuille, J. L. M.* Par. S. Phlm. PV. (1838) 1-; C. R. 11 (1840) 961-, 1041-; 12 (1841) 112-; Par. Mm. Sav. Étr. 9 (1846) 433-.

(Poisuille.) *Regnault, V.* C. B. 15 (1842) 1167-.

*Poiseuille, J. L. M.* C. R. 24 (1847) 1074-; A. C. 21 (1847) 76-.

*Mathieu, É.* C. R. 57 (1863) 320-.

(Poisuille.) *Boussinesq, J.* C. R. 65 (1867) 46-.

*Tait, P. G.* [1873] (xi) Edinb. R. S. P. 8 (1875) 208-.

*Guerout, A.* C. R. 78 (1874) 351-; 81 (1875) 1025-; 83 (1876) 1291-.

*Nagy, J. Regéczy.* [1883] (xii) Mag. Tud. Ak. Étk. (Term.) 13 (1884) (No. 7) 1-; Mth. Nt. B. Ung. 1 (1882-83) 232-.

*Colson, A.* C. R. 113 (1891) 740-.

Chemical composition, transpiration in relation to. *Graham, T. B. A.* C. R. 53 (1861) 774-; Phil. Trans. (1861) 373-.

Effect of temperature. *Guerout, A.* C. R. 79 (1874) 1201-.

Evaporation and transpiration, influence of electricity. *Wirtz, W.* A. Ps. C. 37 (1889) 516-.

Mercury. *Warburg, E.* A. Ps. C. 140 (1870) 367-.

—, *Villari, E.* Bologna Ac. Sc. Mm. 6 (1875) 487-.

Microrheometer, apparatus for measuring rate of transpiration. *Hannay, J. B.* [1878] Phil. Trans. 170 (1879) 275-.

—, Hannay's, viscosity of water determined by. *Barnett, R. E.* R. S. P. 56 (1894) 259-.

Passage through filters, capillary tubes, etc. *Brunhes, J.* [1879] Toul. Ac. Sc. Mm. 3 (1881) (App.) 161 pp.

Poiseuille's law, deviations from. *Wetzstein, G.* A. Ps. C. 68 (1899) 441-.

—, lecture demonstration. *Röntgen, W. C.* A. Ps. C. 20 (1883) 268-.

Salt solutions. *Schulze, F.* C. CB. 3 (1872) 705-.

—, *Hübener, T.* A. Ps. C. 150 (1873) 248-.

Use of transpiration in science and technology. *Loewenthal, J.* Fresenius Z. 10 (1871) 298-; 11 (1872) 43-.

## 0325 Viscosity of Fluids

### 0325 Viscosity of Fluids (Internal Friction). (See also Chemistry 7170.)

- Lundquist, C. G.* Ups. Årsk. (1875) (*Mth.*) (No. 3) 26 pp.  
*Wijkander, E. A.* [1878] A. Ps. C. Beibl. 3 (1879) 8-.  
*Slotte, K. F.* Helsingf. Öfv. 32 (1890) 116-.  
*Mützel, K. A.* Ps. C. 43 (1891) 15-; 44 (1891) 787.  
*Brodmann, C.* A. Ps. C. 45 (1892) 159-.  
*Slotte, K. F.* Helsingf. Öfv. 37 (1895) 11-.  
 Change of order of viscosity on passing from fluid to solid. *Barus, C.* Ph. Mg. 29 (1890) 337-.  
 Damping of oscillations by air. *Sang, E.* Edinb. R. S. P. 16 (1890) 181-.  
 — — in measuring instruments, by air. *Tipler, A.* A. Ps. C. 149 (1873) 416-.  
 — — of solids in fluids. *Klemenčič, I.* [1881] Wien Ak. Sb. 84 (1882) (*Ab.* 2) 146-.  
 Fluids in corresponding states. *Haas, M. de.* Amst. Ak. Vs. [2] (1894) 126-; 3 (1895) 62-.  
 Measure, absolute, for viscosity. *Obermayer, A. von.* Carl Rpm. 15 (1879) 682-.

#### MEASUREMENT OF VISCOSITY.

- Margules, M.* Wien Ak. Sb. 83 (1881) (*Ab.* 2) 588-.  
*Redwood, B.* S. C. In. J. 5 (1886) 121-; 6 (1887) 412.  
*Mills, E. J.* S. C. In. J. 5 (1886) 148-.  
*McGill, A.* [1894] On. Rc. Sc. 6 (1896) 153-.  
*Guyé, P. A., & Friderich, L.* Par. S. C. Bll. 19 (1898) 164-.  
 correction for ends of tubes. *Couette, M. J. de* Ps. 9 (1890) 560-.  
 improvements. *Kissling, R.* Z. Angew. C. (1896) 601-.  
 and influence of magnetisation and electrification. *König, W.* A. Ps. C. 25 (1885) 618-.  
 method. *Meyer, O. E.* A. Ps. C. 43 (1891) 1-; 44 (1891) 787.  
 —, efflux. *Hagenbach, E.* Basel Vh. 2 (1860) 532-.  
 —, Maxwell's. *Schmidt, T. S.* A. Ps. C. 16 (1882) 633 .  
 — of oscillating discs. *Grossmann, L.* [1880] A. Ps. C. 16 (1882) 619-.  
 — oscillations. *Meyer, O. E.* [1887] Münch. Ak. Sb. 17 (1888) 343-; Bresl. Sohl. Gs. Jbr. (1887) 173-.

#### Viscosimeters.

- Babcock, S. M.* [1886] J. Anal. C. 1 (1887) 151-.  
*Engler, C.* Z. Angew. C. (1892) 725-.  
*Lunge's. Scheurer, F.* Mulhouse S. In. Bll. 66 (1896) 57-.  
 for oils. *W., V.* Rv. Sc.-Ind. 18 (1886) 210-.

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- for oils. *Engler, C., & Kunkler, A.* Dingler 276 (1890) 42-; 279 (1891) 115-.  
 — —. *Žukovskij, N. E.* Mosc. S. Sc. Bll. 73 (No. 1) (1891) 25-; Fachr. Ps. (1891) (*Ab.* 1) 262.  
 — — (lubricating). *Kunkler, A.* Dingler 290 (1893) 281-.  
 simple. *Wendriner, M.* Z. Angew. C. (1894) 545-.  
 —. *Kissling, R.* Z. Angew. C. (1894) 642.  
 standards. *Engler, C.* Dingler 286 (1892) 210-.  
 for sugar manufacture. *Dupont, F.* Z. Vr. Rübenzuckin. 47 (1897) (*Th.* 2) 926-.  
 torsion-. *Doolittle, O. S.* Am. Eng. & Railroad J. 67 (1893) 583-.

- Oil and air, friction between. *Markovits, S.* Wien Ak. Sb. 100 (1891) (*Ab.* 2a) 785-.  
 Pendulums, motion, effect of viscosity. *Stokes, G. G.* [1850] Camb. Ph. S. T. 9 (1856) [8]-.  
 Physico-chemical investigation, new method. *Hannay, J. B.* Glasg. Ph. S. P. 11 (1879) 494-.  
 Resistance and viscosity. *Rennie, G.* Phil. Trans. (1831) 423-.  
 Theory. *Meyer, O. E.* Crelle J. Mth. 78 (1874) 130-; 80 (1875) 315-.  
 Variation with chemical composition. *Handl, A., & Pfibram, R.* [1878-81] Wien Ak. Sb. 78 (1879) (*Ab.* 2) 113-; 80 (1880) (*Ab.* 2) 17-; 84 (1882) (*Ab.* 2) 717-.  
 — density. *Warburg, E., & Babo, C. H. L.* von. A. Ps. C. 17 (1882) 390-.  
 — temperature. *Barus, C.* Am. J. Sc. 44 (1892) 255.  
 — — and chemical composition. *Graetz,* —. D. Nf. Tbl. (1887) 83.  
 — —, empirical formulæ. *Duff, A. W.* Ps. Rv. 4 (1897) 404-.  
 — —, Rosencranz's observations. *Meyer, O. E.* A. Ps. C. 2 (1877) 387-.  
 — velocity. *Élie, B. J. de* Ps. 1 (1882) 224-.

#### VISCOSITY OF GASES.

- Faraday, M.* A. C. 5 (1817) 298-.  
*Meyer, O. E.* A. Ps. C. 125 (1865) 177-, 401-, 564-; 127 (1866) 253-, 353-; 148 (1873) 1-, 203-.  
*Meyer, O. E., & Springmühl, F.* [1872] A. Ps. C. 148 (1873) 526-.  
 Friction at a distance. *Govi, G.* Tor. At. Ac. Sc. 5 (1869-70) 199-.  
 —, ethereal. *Stewart, B. B.* A. Rp. 43 (1873) (*Sect.*) 32-.  
 —, —. *Hicks, W. M.* Camb. Ph. S. P. 2 (1876) 422-.  
 Frictional or viscous resistance in the ether. *Rowland, H. A., Gilbert, N. E., & McJunkin, P. C.* J. H. Un. Cir. [19 (1899-1900)] 60.  
 Gases at high exhaustions. *Crookes, W.* [1881] Phil. Trans. 172 (1882) 387-.  
 — — —, decrement of arc of oscillating plate. *Stokes, G. G.* [1881] Phil. Trans. 172 (1882) 435-.  
 — — — temperatures. *Barus, C.* Am. J. Sc. 35 (1886) 407-; A. Ps. C. 36 (1889) 358-.



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- Heating of rotating disc in *vacuo*. *Stewart, B., & Tait, P. G.* B. S. P. 14 (1865) 90, 339-; 15 (1867) 290-; 21 (1873) 309-.
- — — — — (Stewart and Tait). *Meyer, O. E.* A. Ps. C. 135 (1868) 285-; 136 (1869) 330-.
- — — — — (Meyer). *Stewart, B., & Tait, P. G.* (xi) A. Ps. C. 136 (1869) 165-.
- Molecular force, and viscosity of gases. *Sutherland, W.* Ph. Mg. 36 (1893) 507-.
- Theory. *Boltzmann, L.* Wien Ak. Sb. 81 (1880) (Ab. 2) 117-; 84 (1882) (Ab. 2) 40-, 1230-.
- Variation with molecular volume. *Jäger, G.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 447-; 109 (1900) (Ab. 2a) 74-.
- temperature. *Obermayer, A. von.* Wien Ak. Sb. 73 (1876) (Ab. 2) 433-.
- — —. *Wiedemann, E. E. G.* Arch. Sc. Ps. Nt. 56 (1876) 277-.
- — — (gases and vapours). *Schumann, O.* A. Ps. C. 23 (1884) 353-.
- — —. *Breitenbach, P.* A. Ps. C. 67 (1899) 803-.
- — —. *Rayleigh, (Lord).* [1900] B. S. P. 67 (1901) 137-.
- Very rarefied gas, apparatus for demonstrating friction in. *Kundt, A.* A. Ps. C. 158 (1876) 568-, 660.

*Viscosity of Specified Gases.*

- Air. *Schneebeli, H.* Arch. Sc. Ps. Nt. 14 (1885) 197-.
- , experiments. *Murray, J. E.* [1890] Glasg. Ph. S. P. 22 (1891) 199-.
- and other gases. *Maxwell, J. C.* Phil. Trans. 156 (1866) 249-.
- ; measurement. *Tomlinson, H.* [1886] Phil. Trans. 177 (1887) 767-, 795-.
- ; —. *Stokes, G. G.* [1886] Phil. Trans. 177 (1887) 786-.
- ; —. (Pendulums, effect of rotation of ball on logarithmic decrement.) *Stokes, G. G.* [1886] Phil. Trans. 177 (1887) 789-.
- ; —. *Fabry, C., & Perot, A.* C. R. 124 (1897) 281-; A. C. 13 (1898) 275-.
- ; —, Maxwell's method. *Meyer, O. E.* A. Ps. C. 143 (1871) 14-.
- ; — by oscillations. *Braun, W., & Kurz, A.* Carl Rpm. 18 (1882) 569-; 19 (1883) 348-.
- ; — — —. *Meyer, O. E.* Carl Rpm. 18 (1882) 697-.
- ; — — —. *Kurz, A.* Exner Rpm. 19 (1883) 605-.
- , passage through porous bodies with very small pressure differences. *Christiani, A.* Arch. An. Pl. (Pl. Ab.) (1882) 112-.
- , variation with temperature. *Obermayer, A. von.* Wien Ak. Sb. 71 (1875) (Ab. 2) 281-.
- , — — —. *Holman, S. W.* [1876-86] Am. Ac. P. 12 (1877) 41-; 21 (1886) 1-.
- , — — —. *Heen, P. de.* Brux. Ac. Bll. 16 (1888) 195-.
- Argon and helium. *Rayleigh, (Lord).* Nt. 52 (1895) 533; R. S. P. 59 (1896) 198-.
- , variation with temperature. *Rayleigh, (Lord).* R. S. P. 66 (1900) 68-.

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- Hydrogen, variation with moisture. *Rayleigh, (Lord).* R. S. P. 62 (1896) 112-.
- Mercury vapour. *Noyes, A. A., & Goodwin, H. M.* [1896] Am. Ac. P. 32 (1897) 225-.
- — —, variation with temperature. *Koch, S.* A. Ps. C. 19 (1888) 857-.
- Steam at high temperatures. *Cantone, M.* Rm. R. Ac. Linc. Mm. 19 (1884) 253-.

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- Heen, P. de.* Brux. Ac. Bll. 45 (1878) 798-.
- Marangoni, C.* (xiii) Rv. Sc.-Ind. 11 (1879) 144-, 188-.
- Pagliani, S., & Battelli, A.* Tor. Ac. Sc. At. 20 (1885) 607-, 845-.
- Pagliani, S., & Oddone, E.* Tor. Ac. Sc. At. 22 (1886-87) 314-.
- Graetz, L.* A. Ps. C. 34 (1888) 25-.
- Perry, J. L.* Ps. S. P. 12 (1894) 236-; Ph. Mg. 35 (1898) 441-.
- Jones, O. G.* L. Ps. S. P. 13 (1895) 49-; Ph. Mg. 37 (1894) 451-.
- Petroff, N.* St. Pét. Ac. Sc. Bll. 5 (1896) 365-.
- Bibliography, 1800-1889. *Gee, W. W. H.* Manch. Lt. Ph. S. Mm. & P. 3 (1890) 123-.
- Definition. *Hagenbach-Bischoff, E.* Arch. Sc. Ps. Nt. 34 (1895) 877-.
- Elastic after-effect and viscosity. *Roiti, A.* N. Cim. 3 (1878) 5-.
- Electrolytes, solutions. *Euler, H.* Z. Ps. C. 25 (1898) 536-.
- Elements. *Pacher, G.* Ven. I. At. (1897-98) 516-.
- Figures of viscosity. *Issel, A.* Brux. S. Blg. Gl. Bll. (1899) (Mém.) 450-.
- Fluidity measurer, theory. *Heyer, —.* [1893] St. Gal. B. (1893-94) 93-.
- Kinetic theory. *Jäger, G.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 253-.
- Liquid mixtures. *Linebarger, C. E.* Am. J. Sc. 2 (1896) 331-.
- — —. *Thorpe, T. E., & Rodger, J. W.* C. S. J. 71 (1897) (Pt. 1) 360-.
- — — and solutions. *Lees, C. H.* [1900] L. Ps. S. P. 17 (1901) 460-.
- — —, viscosity, temperature and concentration. *Noack, K.* A. Ps. C. 27 (1886) 289-.
- Liquids above their boiling points. *Heydweiller, A.* Bresl. Schl. Gs. Jbr. (1896) (Ab. 2a) 1-; A. Ps. C. 59 (1896) 198-.
- in an electric field. *Pacher, G., & Finazzi, L.* Ven. I. At. (1899-1900) (Pt. 2) 389-.
- at same temperature and some at different temperatures, measurement of viscosity. *Ure, A.* B. A. Rp. (1839) (Pt. 2) 22-.
- Measurement. *Couette, M.* C. R. 107 (1888) 388-; A. C. 21 (1890) 433-.
- , experimental. *Vautier, T.* A. C. 15 (1888) 289-.
- , instruments. *McGill, A.* Cn. R. S. P. & T. 1 (1895) (Sect. 3) 97-.
- by rate of flow from capillary tube. *Wilberforce, L. R.* Ph. Mg. 31 (1891) 407-.
- torsional vibrations. *König, W.* A. Ps. C. 32 (1887) 193-.

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- Navier's equations, verification. *Couette*, —. Par. S. Ps. Sé. (1889) 60-, 108-.
- Organic liquids and their aqueous solutions, specific viscosity. *Traube*, J. Berl. B. 19 (1886) 871-.
- Rate of flow from capillary tube, influence of electricity. *Langer*, C. Exner Rpm. 25 (1889) 461-.
- — — of viscous liquids, application of graphic methods. *Vautier*, T. A. C. 15 (1888) 433-.
- Rigidity. *Schwedoff*, T. [1889-1900] Par. S. Ps. Sé. (1889) 122-; Sc. Abs. 4 (1901) 353.
- and viscosity. *Schwedoff*, T. Par. S. Ps. Sé. (1889) 184-, 186-.
- Salt solutions. *Brückner*, H. A. Ps. C. 42 (1891) 287-.
- — — *Moore*, B. E. Ps. Rv. 3 (1896) 321-.
- — — *Massoulier*, P. C. R. 130 (1900) 773-.
- — — and their mixtures. *Kanitz*, A. Z. Ps. C. 22 (1897) 336-.
- — — mixtures, relation to state of ionisation. *Barnes*, J. [1899] N. Scotia I. Sc. P. & T. 10 (1903) 113-.
- Solutions. *D'Arcy*, R. F. Ph. Mg. 28 (1889) 221-.
- *Jäger*, G. Wien Ak. Sb. 108 (1894) (Ab. 2a) 251-; Mh. C. (1894) 254-.
- , anhydrous. *Smoluchowski*, M. von. Wien Ak. Sb. 102 (1893) (Ab. 2a) 1136-.
- , aqueous. *Reyher*, R. Z. Ps. C. 2 (1888) 744-.
- , — dilute. *Arrhenius*, S. Z. Ps. C. 1 (1887) 285-.
- , —, at temperature of maximum density. *Pacher*, G., & *Finazzi*, L. Ven. I. At. (1899-1900) (Pt. 2) 1033-.
- , viscosity, and variation of viscosity of water with temperature. *Slotte*, K. F. A. Ps. C. 20 (1883) 257-.
- Supercooled liquids. *Tammann*, G. Z. Ps. C. 28 (1899) 17-.
- Superficial viscosity. *Marangoni*, C. (x) N. Cim. 5 & 6 (1871) 239-.
- — — *Luvini*, G. (xii) Rv. Sc.-Ind. 4 (1872) 262-.
- — — (Marangoni). *Plateau*, J. A. F. Brux. Ac. Bil. 34 (1872) 404-; 48 (1879) 106-.
- Variation with chemical composition. *Thorpe*, T. E., & *Rodger*, J. W. [1894-96] Phil. Trans. (A) 185 (1895) 397-; (A) 189 (1897) 71-.
- — — *Thorpe*, T. E. [1896] R. I. P. 15 (1899) 641-.
- — — density. *Warburg*, E., & *Sachs*, J. A. Ps. C. 22 (1884) 518-.
- — — pressure. *Röntgen*, W. C. A. Ps. C. 22 (1884) 510-.
- — — *Cohen*, R. A. Ps. C. 45 (1892) 666-.
- — — temperature. *Heen*, P. de. Brux. Ac. Bil. 7 (1884) 248-; 11 (1888) 29-.
- — — vapour pressure. *Heen*, P. de. Brux. Ac. Bil. 10 (1885) 251-.
- Very viscous liquids. *Schöttner*, F. Wien Ak. Sb. 79 (1879) (Ab. 2) 477-.
- — — *Brodmann*, C. A. Ps. C. 48 (1893) 188-.

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- Acetic acid, pure, and in solution. *Noack*, K. A. Ps. C. 28 (1886) 666-.
- Benzene and ethyl ether above their boiling point. *Heydweiller*, A. A. Ps. C. 55 (1895) 561-.
- Bromine, variation with temperature. *Kann*, L. Wien Ak. Sb. 106 (1897) (Ab. 2a) 431-.
- Chromates, solutions. *Slotte*, K. F. A. Ps. C. 14 (1881) 13-.
- Gelatin solution, viscosity and electrolytic resistance. *Griffiths*, A. Manch. Lt. Ph. S. Mm. & P. 41 (1897) ix-.
- Glycerin. *Schöttner*, F. Wien Ak. Sb. 77 (1878) (Ab. 2) 682-.
- , a periodic damping applied to viscosity measurement. *Riecke*, E. A. Ps. C. 51 (1894) 156-.
- solutions. *Schall*, C., & *Rijn*, W. van. Z. Ps. C. 23 (1897) 329-.
- Mercury. *Umani*, A. N. Cim. 3 (1896) 151-.
- and amalgams, viscosity and electrical conductivity. *Schweidler*, E. (Ritter) von. Wien Ak. Sb. 104 (1895) (Ab. 2a) 273-.
- , variation with temperature. *Koch*, S. A. Ps. C. 14 (1881) 1-.
- Methyl chloride between boiling point and critical point. *Haas*, M. de. Amst. Ak. Vv. [2] (1894) 123-.
- Oils, variation with temperature. *Garvanoff*, J. G. Wien Ak. Sb. 103 (1894) (Ab. 2a) 873-.
- Saponine solution, superficial viscosity of films. *Mensbrugge*, G. van der. Brux. Ac. Bil. 29 (1870) 368-.
- Sulphur, fused. *Pisati*, G. Palermo G. Sc. Nt. 12 (1877) (Pt. 1) 33-.
- Water. *Geoffroy*, L. C. R. 88 (1879) 573-.
- *Mallock*, A. R. S. P. 45 (1889) 126-.
- *Pacher*, G. Ven. I. At. (1898-99) (Pt. 2) 785-.
- , discharge from pipes, influence of temperature. *Baumgartner*, G. A. Ps. C. 153 (1874) 44-.
- , — — — (Baumgartner). *Meyer*, O. E. A. Ps. C. 153 (1874) 619-.
- , — at different temperatures. *Mair*, J. G. I. CE. P. 84 (1886) 424-.
- , "drag" upon water at low velocities. *Haughton*, S. B. A. Rp. (1879) 275-.
- , — — — —, and of air upon air. *Haughton*, S., & *Reynolds*, J. E. [1880] Ir. Ac. P. 3 (1883) 277-.
- , measurement of viscosity by efflux method. *Knibbs*, G. H. N. S. W. R. S. J. 29 (1895) 77-; 30 (1897) 186-.
- , — — — — *Hannay's* microrheometer. *Barnett*, R. E. R. S. P. 56 (1894) 259-.
- , variation with temperature. *Gerstner*, F. J. von. Gilbert A. 5 (1800) 160-.

## 0340 Colloidal Substances

## 0340 Colloidal Substances.

- Absorption and colloids. *Bemmelen, J. M. van.* Z. Anorg. C. 13 (1897) 233-; 18 (1898) 14-, 98-.
- , isothermals of colloidal iron oxide. *Bemmelen, J. M. van.* Z. Anorg. C. 20 (1899) 185-.
- Colloid films, spiral cracks formed during drying. *Rhumbler, L.* Ps. Z. 1 (1900) 41-.
- , metallic solutions, nature. *Stoeckl, K., & Vanino, L.* Z. Ps. C. 30 (1899) 98-.
- , —, (Stoeckl & Vanino). *Zsigmondy, R.* Z. Ps. C. 33 (1900) 63-.
- , —, (Zsigmondy). *Stoeckl, K., & Vanino, L.* Z. Ps. C. 34 (1900) 378-.
- , solutions. *Bredig, G., & Coehn, A.* Z. Ps. C. 32 (1900) 129-.
- , coagulation. *Stark, J. A.* Ps. C. 68 (1899) 618-.
- , —, speed. *Linebarger, C. E.* Am. C. S. J. 20 (1898) 375-.
- , —, freezing. *Ljubawin, N.* Berl. B. 22 (1889) (Ref.) 727-.
- , —, gold. *Zsigmondy, —.* Z. Elektch. (1897-98) 546-.
- , —, nature. *Barus, C., & Schneider, E. A.* Z. Ps. C. 8 (1891) 278-.
- , —, —. *Linebarger, C. E.* Am. J. Sc. 43 (1892) 218-.
- , —, physical behaviour. *Lildekking, C. A.* Ps. C. 35 (1888) 552-.
- , —, silver. *Capranica, S., & Carbonelli, E.* Genova S. Lig. At. 5 (1884) 279-.
- , —, stability. *Hardy, W. B.* Z. Ps. C. 33 (1900) 385-.
- , —, theory. *Kraft, F.* Berl. B. 29 (1896) 1334-.
- Colloidal state of metals. *Lottermoser, A.* D. Nf. Vh. (1899) (Th. 2, Hälfte 1) 122-.
- Colloids. *Wiedemann, E.* Berl. Ps. Gs. Vh. (1884) 44-.
- , constitution. *Bourgeois, A., & Schützenberger, P.* C. R. 82 (1876) 262-.
- , influence on forms of inorganic matter. *Ord, W. M.* St. Thom. Hosp. Rp. 2 (1871) 1-.
- , —, —, and molecular coalescence. *Ord, W. M.* QJ. Mcr. Sc. 12 (1872) 219-.
- , nature, and circumstances of formation and transformation. *Bemmelen, J. M. van.* Rec. Tr. C. P.-Bas 7 (1888) 37-, 118.
- , —, and oils, mechanical properties. *De-Metc [De Metz], G. G.* N. Rs. S. Nt. Mm. (Mth.) 9 (1889) 139-.
- , —, phenomena of drying. *Gladstone, J. H., & Hibbert, W.* B. A. Rp. (1899) 709.
- , —, physical condition. *Pauli, W., & Rona, P.* Wien Az. 37 (1900) 282-.
- Deposition of clays. *Hunt, T. S.* Bost. S. NH. P. 16 (1874) 302-.
- , —, pulverulent bodies in liquids. *Scheerer, T.* Pogg. A. 82 (1851) 419-.
- Flocculation of particles. *Hilgard, E. W.* Am. J. Sc. 17 (1879) 205-.
- , —, turbid media. *Spring, W.* Brux. Ac. Bll. (1900) 483-.

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- Muddy waters, clarification. *Darcet, F. A.* Hyg. Pbl. 4 (1830) 375-.
- , —, clarifying action of alum. *Jennet, C.* C. R. 61 (1865) 598-; Mon. Sc. 7 (1865) 1007-.
- Precipitation, false. *Stark, J. A.* Ps. C. 68 (1899) 117-.
- , —, of mud by very dilute saline solutions. *Schlasing, T.* C. R. 70 (1870) 1345-.
- Sedimentary phenomena, and their connection with allied physical conditions. *Schulze, F. A.* Ps. C. 129 (1866) 366-.
- Segregation phenomena in turbid liquids on standing. *Guéhard, A.* Par. S. Ps. Sé. (1897) 107-.
- Subsidence of particles in liquids. *Brewer, W. H.* [1883] Wash. Nat. Ac. Mm. 2 (\*1884) 165-.
- , —, —. *Barus, C.* U. S. Gl. Sv. Bll. No. 36 (1886) 51 pp.; No. 60 (1890) 139-.
- , —, suspended clay caused by lime, salts, etc. *Sachse, R., & Becker, A.* Lndw. V.-St. 43 (1894) 15-.
- Suspended matter in solution and sediments, investigations. *Bodländer, G.* N. Jb. Mm. (1893) (Bd 2) 147-.
- Suspension and sedimentation of clays. *Brewer, W. H.* Am. J. Sc. 29 (1885) 1-.
- Suspensions, clearing by passage of electric current. *Bodländer, G.* D. Nf. Vh. (1893) (Th. 2, Hälfte 1) 179-.

## 0400 Molecular Theories of Crystals and other Solids. (See also Elasticity, Mechanics 3210 and Mineralogy 140.)

- Byss-Ballot, C. H. D.* Amst. Vs. Ak. 5 (1857) 77-.
- Guldberg, C. M.* [1867-68] Christiania F. 10 (1867) 140-, 159-; 11 (1868) 15-; 14 (1871) 480-.
- Aggregation, material, influence on manifestations of force. *Tyndall, J.* [1853] R. I. P. 1 (1851-54) 254-.
- , —, state of, change. *Wittwer, W. C.* Z. Mth. Ps. 23 (1878) 286-.
- , —, —, effect of heat. *De La Rue, W.* [1841] C. S. Mm. 1 (1841-43) (P.) 18-.
- , —, states of. *Frankenheim, M. L.* Pogg. A. 39 (1836) 376-.
- , —, —, theory. *Ritter, A.* A. Ps. C. 2 (1877) 273-.
- Aragonite and limestone, and their molecules. *Lu Méthérie, J. C. de.* J. de Ps. 63 (1806) 70-.
- Atomic arrangement and conducting power of bodies, connection. *Pollock, T.* [1838] (vi Adds.) Electr. S. P. (1837-40) 145-.
- Atoms, equilibrium, and elasticity of solids in Boscovich's theory. *Thomson, (Sir) W.* C. R. 109 (1889) 337-.
- Attraction and heat. theory. *Heine, H. E.* Crelle J. 29 (1845) 185-.
- , —, molecular. *Lacroix, S. F.* Par. S. Phlm. Bll. 1 (1797) 173-.
- , —, —. *Belli, G.* Brugnattelli G. 7 (1814) 110-, 169-.

- Attraction, molecular. *Bouché, A. M.-et-L.* Mm. S. Ac. 6 (1859) 229-; 8 (1860) 133-; 10 (1861) 181-.
- , —, *Geigel, R.* Würzb. Ps. Md. Sb. (1891) 68-.
- , —, effect of heat. *Dini, O.* [1845] (vii) Mod. Mm. Ac. Sc. 2 (1858) 388-.
- , —, law. *Belli, G. A.* Sc. Lomb. Ven. 2 (1832) 289-, 313-.
- , —, in relation to temperature of bodies. *Lévy, M.* C. R. 87 (1878) 488-.
- , nature. *Feuillet, —.* Fr. Cg. Sc. 16 (1849) 97-.
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- theories of physical phenomena. *Michelson, V. A.* Bs. Ps.-C. S. J. 23 (Ps.) (1891) 415-; J. de Ps. 1 (1892) 404.
- theory of electricity and chemical action. *Whitwell, A.* Elect. Rv. 40 (1897) 84-, 68-, 97-.
- Modern physics, method and theories. *Witz, A.* Bv. Quest. Sc. 30 (1891) 39-.
- Molecular action as function of distance. *Gros, A.* Gén. Civ. 15 (1889) 293-.
- , homogeneous; 3 states of matter; porosity, density and volume of bodies. *Volpicelli, P.* Rm. At. 1 (1847-48) 129-.
- , theory. *Mossotti, O. F.* Taylor Sc. Mm. 1 (1837) 448-.
- , —. *Cooper, P.* (vi Adds.) Ph. Mg. 10 (1837) 355-.
- , — (Mossotti's). *Exley, T.* Ph. Mg. 11 (1837) 496-.
- , — (—). *Fusini, A.* A. Sc. Lomb. Ven. 7 (1837) 159-.
- , — (—). *E., R. L.* Ph. Mg. 19 (1841) 384-.
- , — (—). *Kelland, P.* (vi Adds.) Ph. Mg. 20 (1842) 8-.
- , —, according to Newton's law. *Kelland, P.* Ph. Mg. 21 (1842) 124-, 202-, 263-, 344-, 422-; 22 (1843) 116-, 194-.
- , —, —. *Earnshaw, S.* (vi Adds.) Ph. Mg. 21 (1842) 340-, 437-.
- actions explained by universal gravitation. *Commines de Marsilly, (le gén.) L. J. A. de.* As. Fr. C. R. (1885) (Pt. 2) 1-.
- equilibrium. *Kelland, P.* [1838] Camb. Ph. S. T. 7 (1842) 25-.
- motion. *Thirion, J.* Rv. Quest. Sc. 7 (\*1890) 5-.
- , cause. *Croll, J.* Ph. Mg. 44 (1872) 1-.
- , irreversible. *Culverwell, E. P.* B. A. Bp. (1890) 744.
- theories. *Séguin, — (ainé).* C. R. 27 (1848) 314-; 28 (1849) 97-; 29 (1849) 425-; 34 (1852) 85-.
- Molecular theories, Séguin's. [*Moigno, F.* non] *Séguin, — (ainé).* Moigno Cosmos 1 (1852) 692-.
- , —. *Moigno, F.* Moigno Cosmos 2 (1853) 371-, 625-.
- theory. *Handl, A.* Wien Sb. 56 (1867) (Ab. 2) 569-.
- and electricity. *Lorenz, L.* A. Ps. C. 140 (1870) 644-.
- , new, outlines. *Simony, O.* Z. Mth. Ps. 18 (1873) 463-; 19 (1874) 299-.
- vibrations. *Doppler, C.* Böhm. Gs. Ab. 4 (1845-46) 621-.
- , —. *Baudrimont, A.* Fr. Cg. Sc. 28 (1861) 512-.
- , —. *Girdwood, G. P.* [1894] Cn. R. S. P. & T. 12 (1895) (Sect. 3) 3-.
- , —, internal. *Briot, C.* Liouv. J. Mth. 13 (1868) 304-.
- , —, law connecting periods. *Schuster, A.* [1896] Nt. 55 (1896-97) 200-, 223.
- , —, —. *Herschel, A. S.* Nt. 55 (1896-97) 271.
- Molecularium, Berliner's. *Anon.* Tel. J. 22 (1888) 255-.
- Molecules. *Maxwell, J. C.* Ph. Mg. 46 (1873) 453-.
- , motions of and within. Ratio of specific heats in gases. *Stoney, G. J.* R. S. P. 58 (1895) 177-.
- , mutual actions between. *Berthot, P. C. B.* 98 (1884) 1570-.
- , —, — (Berthot). *Saint-Venant, — de.* C. B. 99 (1884) 5-.
- , —, —. *Berthot, P. C. R.* 100 (1885) 1070-.
- , reflection and refraction of system. *Cauchy, A. L.* C. B. 8 (1839) 985-; 9 (1839) 1-, 59-, 91-.
- , ultimates, atoms and waves. *Ponton, M.* QJ. Sc. 1 (1871) 170-, 349-, 461-.
- Potential energy hypothesis, apparent elasticity, experiments. *Bell, A. G.* Science 11 (1888) 196.
- Radio-dynamics. *Chase, P. E.* Franklin I. J. 82 (1881) 57-, 123-, 274-; C. N. 44 (1881) 265; Franklin I. J. 83 (1882) 433-.
- Rigidity imparted by rapid motion. *Prevost, P.* Bb. Un. 30 (1825) 32-.
- Solids and fluids, internal structure. *Trojanowski, J.* [1861] (xii) Krk. Ak. (Mt.-Prs.) Rz. & Sp. 9 (1862) 275-, xxx-; 10 (1863) v.
- liquids, molecular condition. *Emmett, J. B.* Ph. Mg. 1 (1827) 411-.
- Texture in media; non-existence of density in the ether. *Stoney, G. J.* Dubl. S. Sc. P. 6 (1888-90) 392-.
- Transformation of state of bodies, new theory. *Moulin, H.* Par. S. Ps. S6. (1896) 45-, 268-.
- Transparent media, constitution. *Baudrimont, A.* Bordeaux Mm. S. Sc. 2 (1861-63) 203-.

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- Vortex atom theory. *Croll, J.* Am. J. Sc. 26 (1883) 478-.
- , —, currents of gas in. *Fitzgerald, G. F.* Dubl. S. Sc. P. 4 (1885) 339-.



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- Vortex atom theory, physical aspects. *Preston, S. T.* Nt. 22 (1880) 56-.
- atoms. *Thomson, (Sir) W.* Ph. Mg. 34 (1887) 15-.
- , Thomson's. *Studskii, F. A.* Mosc. S. Nt. Bil. 53 (1878) (Pt. 2) 272-.
- and ultramundane corpuscles. *Forbes, G. B. A.* Rp. (1878) 498-.
- motion of atoms, chemico-physical theory. *Czyrniański, E.* [1883] (xii) Krk. Ak. (Mt.-Prz.) Bz. & Sp. 11 (1884) 218-, LXVI-.
- — —, mechanico-chemical theory. *Czyrniański, E.* (xii) Krk. Ak. (Mt.-Prz.) Bz. & Sp. 2 (1875) 156-, CVI-.
- , recent English researches. *Love, A. E. H.* Mth. A. 30 (1887) 326-.
- ring theory of gases, distribution of energy. *Thomson, J. J.* R. S. P. 39 (1896) 23-.
- rings, properties. *Marangoni, —.* Rv. Sc.-Ind. 32 (1900) 211.
- , —, (Marangoni). *Vicentini, —.* Rv. Sc.-Ind. 32 (1900) 211-.
- Vortices, molecular, hypothesis, and application to theory of heat. *Rankine, W. J. M.* Edinb. R. S. P. 2 (1844-50) 275-; B. A. Rp. (1851) (pt. 2) 3-; Edinb. R. S. T. 20 (1853) 425-; Ph. Mg. 10 (1855) 354-, 411-; 27 (1864) 313.
- , —, applied to gases and vapours. *Rankine, W. J. M.* Ph. Mg. 2 (1851) 509-.
- , —, theory, applied to action of magnetism on polarised light. *Maxwell, J. C.* Ph. Mg. 23 (1862) 85-.
- , —, — electric currents. *Maxwell, J. C.* Ph. Mg. 21 (1861) 281-, 338-.
- , —, — magnetic phenomena. *Maxwell, J. C.* Ph. Mg. 21 (1861) 181-.
- , —, — — — (Maxwell). *Challis, J.* Ph. Mg. 21 (1861) 250-.
- , —, — static electricity. *Maxwell, J. C.* Ph. Mg. 23 (1862) 12-.
- , —, thermal energy. *Rankine, W. J. M.* Edinb. R. S. T. 25 (1869) 557-.

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- Fitzgerald, G. F.* B. A. Rp. (1888) 557-.
- Hicks, W. M.* B. A. Rp. (1895) 595-.
- Wiechert, E.* Königsb. Schr. 35 (1895) [4]-.
- Action at a distance, and waves. *Cornu, A.* Par. Bur. Long. An. (1896) A. 26 pp.
- Actions, central, general laws relating to effect of media. *Le Roux, F. P.* C. R. 119 (1894) 211-.
- Atomic hypothesis, a certain. *Pearson, K.* [1885-88] Camb. Ph. S. T. 14 (1889) 71-; L. Mth. S. P. 20 (1889) 88-.
- Cerebral radiation. *Houston, E. J.* Franklin I. J. 133 (1892) 488-.
- Curved spaces, Maxwell's theory in. *Padova, E.* Rm. B. Ac. Linc. Rd. 5 (1889) (Sem. 1) 875-.
- Dilatancy, a property of granular material. *Reynolds, O.* [1886] R. I. P. 11 (1887) 354-.
- Dispersion in celestial spaces. *Tikhoff, G. A.* Spet. It. Mm. 27 (1899) 41-.

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- Elastic medium, isotropic, plane waves of 3rd order in. *Pearson, K.* Camb. Ph. S. P. 5 (1886) 296-.
- method of treating electrostatic theorems. *Bragg, W. H.* Aust. As. Rp. (1891) 57-; Ph. Mg. 34 (1892) 18-.
- Electric, magnetic and luminous phenomena, new interpretation. *Padova, E.* N. Cim. 29 (1891) 225-.
- phenomena, mechanical processes underlying. *Grünwald, A. K.* Böhm. Gs. Ws. Jbr. (1894) 68 pp.
- Electricity and magnetism, kinetic hypothesis. *Světovidov, S. N.* Rs. Ps.-C. S. J. 23 (Ps.) (1890) 106-; Fachr. Ps. (1890) (Ab. 2) 408-.
- Electromagnetic basis for mechanics, possibility. *Wien, W.* Arch. Néerl. 5 (1900) 96-.
- field, forces, stresses and fluxes of energy in. *Heaviside, O.* [1891] Phil. Trans. (A) 183 (1893) 423-.
- Electrostatic force, velocity of propagation. *Kelvin, (Lord).* Nt. 53 (1895-96) 316.
- , —, —. *Leahy, A. H.* Nt. 53 (1895-96) 364.
- , —, —. *Kelvin, (Lord).* Nt. 53 (1895-96) 364-.
- , —, —. *Gibbs, J. W.* Nt. 53 (1895-96) 509.
- Energy movements in medium between electrified or gravitating particles. *Allen, H. N.* L. Ps. S. P. 13 (1895) 392-; Ph. Mg. 39 (1895) 357-.

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- Tadini, —.* Bb. It. 65 (1892) 75-.
- Brooke, C.* B. A. Rp. 40 (1870) (Sect.) 36-.
- Nipher, F. E.* Am. As. P. (1891) 127-.
- action at a distance in. *Heim, G. A.* Ps. C. 14 (1881) 149-.
- density. *Glan, P.* A. Ps. C. 7 (1879) 655-.
- (Glan). *Wiedemann, E. E. G.* A. Ps. C. 17 (1862) 986-.
- and elasticity, and nature of electricity and magnetism. *Fessenden, R. A.* Am. As. P. (1899) 115-; Ps. Rv. 10 (1900) 1-, 83-.
- , — heat of bodies. *Puschl, K.* Wien Ak. Sb. 69 (1874) (Ab. 2) 324-.
- polarity. *Chase, P. E.* Am. Ph. S. P. 12 (1872) 407-.
- , — size of Maxwell's molecular vortices. *Graetz, L.* A. Ps. C. 25 (1885) 165-; Exner Rpm. 21 (1885) 530-.
- of Descartes and Newton. *Breton, P.* (xii) Isère S. Bil. 4 (1875) 8-, 177-.
- duties for electricity and magnetism. *Kelvin, (Lord).* Ph. Mg. 50 (1900) 305-.
- dynamics. *Kennelly, A. E., & Fessenden, R. A.* Ps. Rv. 1 (1894) 459-.
- electrical conductivity. *Trowbridge, J.* Ph. Mg. 43 (1897) 378-.
- and electricity. *Stoletow, A.* Lum. Elect. 35 (1890) 517-, 556-.
- and matter. *Gray, J.* Tel. J. 23 (1891) 208-, 261-.
- — ponderable matter. *Thomson, (Sir) W.* [1889] I. Elect. E. J. 18 (1890) 4-.

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— — — *Preston, S. T. Nt.* 27 (1883) 579.

— gravitation. *Dubois, E. A. Gén. Civ.* 3 (1864) 233-, 305-.

— — — *Finlay, C. Habana Ac. A.* 9 (\*1872) 406-; 11 (\*1874) 429-, 469-.

— — — *Ball, W. W. R. Mess. Mth.* 21 (1892) 20-.

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— *Clark, J. M.* [1889] *Cn. I. T.* 2 (1892) 93-.

— *Stokes, (Sir) G. G.* [1893] *Vict. I. J.* 28 (1896) 89-.

— constitution. *Earnshaw, S.* [1839] *Camb. Ph. S. T.* 7 (1842) 97-.

— — — *Stokes, G. G. Ph. Mg.* 32 (1848) 343-.

— — — on the vortex atom theory. *Hicks, W. M. B. A. Rp.* (1885) 930-.

— and electrical, identity. *Wild, H. Bern Mt.* (1864) 194-.

— — — existence. *Cook, E. H. Ph. Mg.* 7 (1879) 225-; 11 (1881) 477-.

— — — hypotheses. *Fizeau, H. L. C. R.* 33 (1851) 349-; *A. C.* 57 (1859) 385-.

— — — theory. *Thomson, (Sir) W. Ph. Mg.* 26 (1888) 414-, 500-.

— — — Sir W. Thomson's. *Glazebrook, R. T. Ph. Mg.* 26 (1888) 521-.

— — — — — *Schiller, N. N. Rec. Mth. (Moscou)* 19 (1897) 94-.

— — — trajectory of molecule. *Meier, F. Liège Mm. S. Sc.* 13 (1858) 271-.

— — — vortex theory, propagation of laminar motions. *Thomson, (Sir) W. B. A. Rp.* (1887) 486-.

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— — — *Moulton, J. F.* [1877] *R. I. P.* 8 (1879) 335-.

— — — absence of mechanical connection. *Lodge, O. Phil. Trans. (A)* 189 (1897) 149-.

— — — connection. *Lodge, O. Nt.* 48 (1893) 527.

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— — — and material molecules, relations. *Wittwer, C. D. Nf. B.* (\*1883) 68-.

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— (Klinkerfues's experiment). *Haga, H. Arch. Néerl.* 5 (1900) 583-.

— near Earth, and aberration problems. *Lodge, O. J.* [1893] *Phil. Trans. (A)* 184 (1894) 727-; *Ph. Mg.* 36 (1893) 549-.

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— — — *Wien, W.* [1900] *Ps. Z.* 2 (1901) 148-.

— — — (Wien). *Mie, G.* [1900] *Ps. Z.* 2 (1901) 181-.

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— — — electricity through. *Preston, S. T. Elect.* 27 (1891) 519-, 552-.

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— — — models illustrating. *Fitzgerald, G. F. Dubl. S. Sc. P.* 4 (1885) 407-; *L. Ps. S. P.* 7 (1886) 74-; *Ph. Mg.* 19 (1885) 438-.

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- , resistance of molecules to. *Boussinesq, J.* *C. R.* 117 (1893) 138-.
- , theory, and chemical action of light. *Fusini, A.* *A. Sc. Lomb. Ven.* 11 (1841) 142-.
- viscosity, experiments. *Lodge, —.* *Nt.* 44 (1891) 454.
- waves, and their action. *Preston, S. T.* *Elect.* 28 (1892) 899-.
- , possibility of electric forces causing. *Fitzgerald, G. F.* [1879-82] *Dubl. S. Sc. T.* 1 (1883) 133-, 173-, 325-.
- whirls and projections (Savart's figures). *Heen, P. de.* *Brux. Ac. Bill.* (1899) 589-; *Arch. Sc. Ps. Nt.* 9 (1900) 147-.
- Force, vehicle of. *Morris, C.* *J. Sc.* 2 (1880) 607-.
- Heat, conic theory. *Harbord, J. B.* *Ph. Mg.* 34 (1867) 106-, 185-.
- Law of Fresnel. *Jablonski, E.* *Liouv. J. Mth.* 2 (1886) 441-.
- Luminiferous and electric medium, dynamical theory. *Larmor, J.* [1893-94] *Phil. Trans. (A)* 185 (1895) 719-.
- — — — — (Electrons, theory.) *Larmor, J.* [1895] *Phil. Trans. (A)* 186 (1896) 695-.
- — — — — (Larmor). *Poincaré, H.* *Éclair. Élect.* 3 (1895) 5-, 289-; 5 (1895) 5-, 385-.
- — — — — (Relations with material media.) *Larmor, J.* [1897] *Phil. Trans. (A)* 190 (1898) 205-.
- — — — — (Electrodynamic equations of moving material medium, and electrostriction.) *Larmor, J.* *R. S. P.* 63 (1898) 365-.
- Magnetic action on light, theory. *Larmor, J.* *B. A. Rp.* (1893) 335-.
- — — — — (Larmor). *Basset, A. B.* *Nt.* 52 (1895) 618.
- medium in interspaces of matter. *Codazza, G.* [1855] *Mil. G. I. Lomb.* 8 (1856) 247-.
- Material medium pervading space, existence. *Stewart, B.* *R. I. P.* 4 (1866) 558-.
- Matter of space. *Morris, C.* *Nt.* 27 (1883) 349-; 28 (1883) 148-.
- Motion, communication in rationally distributed medium. *Marsilly, (le gén.) L. J. A. de C. de.* *As. Fr. C. R.* (1890) 140-.
- in infinite elastic solid, produced by body moving through same space. *Kelvin, (Lord).* [1900] *Edinb. R. S. F.* 23 (1902) 218-.
- of sphere in infinite elastic medium, and reaction of medium on sphere, theory. *Brillouin, —.* *A. C.* 2 (1894) 117-.
- Pressure of light energy, Maxwell-Bartoli's. *Lebedev, P.* *Rs. Ps.-C. S. J.* 32 (*Ps.*) (1900) 211-; *Sc. Abs.* 4 (1901) 485.
- Principles of mechanics; constitution of bodies; theory of perfect gases. *Boussinesq, J.* [1872] *Mntp. Mm. Ac. Sect. Sc.* 8 (1872-75) 109-; *Liouv. J. Mth.* 18 (1878) 305-.
- Properties of a medium, influence of obstacles arranged in rectangular order on. *Rayleigh, (Lord).* *Ph. Mg.* 34 (1892) 481-.
- Ray vibrations. *Faraday, M.* *Ph. Mg.* 28 (1846) 345-.
- — — — — and atoms. *Whelpley, J. D.* *Silliman J.* 48 (1845) 352-; 2 (1846) 401-.
- Synthesis of the heavens and the earth. *Moigno, F. N. M.* *C. R.* 96 (1833) 1166-.
- Thermodynamics, cosmical. *Chase, P. E.* [1874] *Am. Ph. S. P.* 14 (1876) 141-.
- Undulations, primitive, velocity. *Chase, P. E.* *Am. As. P.* 23 (1874) (*Pt. 1*) 99-.
- Universal change, finality, question regarding one of the physical premises upon which it is based. *Preston, S. T.* *Ph. Mg.* 10 (1880) 338-.
- Universe, possibility of explaining past changes by causes at present in operation. *Preston, S. T.* *J. Sc.* 8 (1878) 360-.

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- Longo, A.* (vi *Adds.*) *Palermo Effem.* 5 (1833) 19-.
- Challis, J.* *Ph. Mg.* 18 (1859) 442-.
- Hoefler, L.* *Coamos* 24 (1864) 67-.
- Lecoq de Boisbaudran, —.* *C. R.* 69 (1869) 703-.
- Vaschy, —.* *J. de Ps.* 5 (1886) 165-.
- Joly, J.* *Nt.* 51 (1894-95) 57-, 127, 223.
- Worthington, A. M.* [1894] *Nt.* 51 (1894-95) 79.
- Lodge, O. J.* [1894] *Nt.* 51 (1894-95) 154.
- Attraction, material, and gravity in particular, nature. *Robida, K.* [1870] (xii) *Kärnten Landms. Jb.* 10 (1871) 172-.
- , Newtonian, flux of mechanical energy for motion of bodies under. *Volterra, V.* *Tor. Ac. Sc. At.* 34 (1898) 238- or 366-, 601- or 805-; *N. Cim.* 10 (1899) 387-.
- , —, and natural phenomena. *Séguin, — (ainé).* *Moigno Cosmos* 18 (1861) 681-.
- , —, new method of symbolising. *Hamilton, (Sir) W. R.* *Ir. Ac. P.* 3 (1847) 344-.
- , theory, by Maxwell's method. *Gosciewski, W.* *Prace Mt.-Fiz.* 8 (1897) 178-; *Fschr. Ps.* (1898) (*Ab. 1*) 388-.
- , universal. *Laborde, —.* *Les Mondes* 55 (1881) 356-.
- , — law. *Smythies, J. K. R. S. P.* 5 (1849) 831-.
- , —, and magnetism. *Maggi, P. G.* *Verona Mm. Ac. Ag.* 25 (1851) 181-.
- , —, —. *Sludskit, T. A.* (xii) *Rec. Mth. (Moscou)* 3 (1868) (*Pt. 2*) 123-.
- Attractive force, origin. *Chase, P. E.* [1874] *Am. Ph. S. P.* 14 (1876) 111-.
- and repulsive forces, and action through a medium. *Tannery, P.* *J. de Ps.* 6 (1877) 242-.
- — — — — generation by fluid pressures. *Tannery, P.* *Bordeaux S. Sc. Mm.* 2 (1878) 95-.

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- Displacements in homogeneous medium due to small expansions or contractions. *Boussinesq*, *J. C. R.* 94 (1882) 1648-.
- Electromagnetic theory of the heavenly motions. *Behr*, *H. von*. [1846] (vi *Adds.*) Königsb. *Nw. Unterh.* 1 (1847) 213-.
- Falling motion, origin. *Morris*, *C. J. Sc.* 2 (1880) 367-.

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- Anon.* (vi 1166) *Sturgeon A. Electr.* 9 (1842) 317-.
- Buff*, *H.* *Zwolle Voornitgang* 1 (1851) 131-.
- Walling*, *H. F.* *Am. J. Sc.* 40 (1865) 254-.
- Mackereth*, *T.* *Manch. Lt. Ph. S. P.* 20 (1881) 77-.
- Fabian*, *O.* (xii) *Kosmos (Lw.)* 7 (1882) 56-.
- Jarolimek*, *A.* [1883] *Wien Ak. Sb.* 88 (1884) (Ab. 2) 897-.
- Lorentz*, *H. A.* *Amst. Ak. Vs.* 8 (1900) 603-; *Amst. Ak. P.* 2 (1900) 559-.
- as absorption. *Isenkrahe*, *C.* *Z. Mth. Ps.* 87 (1892) (*Suppl.*) 161-.
- application of theory of images. *Lipschitz*, *R.* [1861] *Crelle J.* 61 (1863) 22-.
- attempts to explain. *Lindelöf*, *L. L.* *Helsingf. Öfv.* 12 (1870) 37-.
- — —, *Tannery*, *P.* *Bordeaux S. Sc. Mm.* 5 (1890) 101-.
- cause (pamphlet by Vince). *Young*, (*Dr.*) *T.* [*Signed Dytiscus.*] *Nicholson J.* 19 (1808) 304-; 20 (1808) 276-.
- (*Dytiscus*). *Vince*, *S.* *Nicholson J.* 19 (1808) 344-.
- , *Wakelin*, *T. B.* [1880] *N. Z. I. T.* 18 (1881) 122-.
- of laws. *Avenarius*, *M. P.* [1880] (xii) *Kiev S. Nt. Mm.* 6 (2) (1881) 63-.
- , and pendulum experiments. *Thompson*, *J. B.* *C. N.* 60 (1889) 295-.
- , — universal attraction. *Keller*, *É.*, & *Keller*, *F. A. E.* *C. R.* 56 (1863) 530-.
- and cohesion. *Thomson*, (*Sir*) *W.* *Edinb. R. S. P.* 4 (1862) 604-.
- conservation of energy. *Brücke*, *E.* *Wien SB.* 25 (1857) 19-.
- — —, *Young*, (*Rev.*) *G. P. Cn. J.* 14 (1875) 589-.
- dynamical explanation. *Preston*, *S. T.* *Wien Ak. Sb.* 87 (1883) (Ab. 2) 795-.
- —, *Rysánek*, *A.* *Exner Bpm.* 24 (1888) 90-.
- theories, comparative review. *Preston*, *S. T.* *Ph. Mg.* 39 (1895) 145-.
- within Earth. *Nystrom*, *J. W.* *Franklin I. J.* 22 (1851) 205-.
- elasticity theory. *Beltrami*, *E.* *Mil. I. Lomb. Rd.* 17 (1884) 581-.
- electrical theory. *Leray*, (*l'abbé*) —. *Les Mondes* 22 (1870) 760-.
- —, *Franklin*, *W. S.* *Science* 12 (1900) 887-.
- and electricity, possible relation. *Faraday*, *M.* [1850] *Phil. Trans.* (1851) 1-.
- the ether. *Dubois*, *E. A. Gén. Civ.* 3 (1864) 233-, 305-.
- — —, *Finlay*, *C.* *Habana Ac. A.* 9 (\*1872) 406-; 11 (\*1874) 429-, 469-.
- Euler's theory. *Isenkrahe*, *C.* [1880] *Z. Mth. Ps.* 26 (1881) (*H.-lt. Ab.*) 1-.
- experiments. *Wakelin*, *T.* [1884] *N. Z. I. T.* 17 (1885) 407-.
- fallacy as to theory. *Alvord*, *B.* [1882] *Smiths. Misc. Col.* 25 (1883) Art. 2, 85-.
- (*Wash. Ph. S. Bll.* 5 (1883).)
- and heat. *Greguss*, *G.* [1870] (xii) *Mag. Tud. Ak. Étk. (Term.)* 2 (1872) (No. 5) 14 pp.
- —, alleged connection. *Schuller*, *A.* [1875] (xii) *Mag. Tud. Ak. Étk. (Term.)* 6 (1876) (No. 4) 8 pp.
- Huygens's hypothesis. *Anon.* (vi 230) *Bb. Ün.* 24 (1823) 3-.
- hydrodynamical theory, model for. *Korn*, *A.* *Münch. Ak. Sb.* 27 (1898) 197-.
- hypotheses. *Croll*, *J.* *Ph. Mg.* 34 (1867) 449-.
- and inertia. *Fessenden*, *R. A.* *Science* 12 (1900) 325-.
- kinetic theories. *Taylor*, *W. B.* *Smiths. Rp.* (1876) 205-.
- theory, bearing on phenomena of cohesion and chemical action. *Preston*, *S. T.* *Ph. Mg.* 5 (1878) 297-.
- according to laws of thermodynamics. *Anderssohn*, *A.* *Z. Nw.* 10 (1874) 242-.
- Le Sage theory (ultramundane corpuscles). *Thomson*, (*Sir*) *W.* [1871] *Edinb. R. S. P.* 7 (1872) 577-.
- — —, *Croll*, *J.* *Ph. Mg.* 5 (1878) 45-.
- — —, dynamical conditions applicable to. *Preston*, *S. T.* *Ph. Mg.* 4 (1877) 206-, 364-.
- — —, objection. *Farr*, *C. C.* [1897] *N. Z. I. T.* 30 (1898) 118-.
- Le Sage-Thomson theory, difficulties in. *Oliver*, *J. E.* *Am. As. P.* (1892) 88-.
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- —, cosmical relations. *Chase*, *P. E.* [1869] *Am. Ph. S. P.* 11 (1871) 103-.
- —, relative velocities. *Chase*, *P. E.* *Am. Ph. S. P.* 13 (1873) 148-.
- mechanical theory. *Kjaer*, *H. J.* *Christiania F.* (1892) *No.* 12, 30 pp.; *Fschr. Ps.* (1892) (Ab. 1) 209-.
- —, *Casalunga*, —. *As. Fr. C. B.* (1900) (Pt. 1) 138-.
- —, importance of experiments. *Preston*, *S. T.* *Ph. Mg.* 11 (1881) 391-.
- mechanism. *Odstrčil*, *J.* *Wien Ak. Sb.* 89 (1884) (Ab. 2) 485-.
- molecular attraction or chemical affinity referred to. *Libes*, *A.* *J. de Ps.* 54 (1802) 391-, 443-.
- and molecular attraction, identity. *Nobili*, *L.* *Brunatelli G.* 10 (1817) 259-.
- — energy of matter. *Sutherland*, *A.* [1877] *Vict. R. S. T.* 14 (1878) 84-.
- nature of the ether, hypothesis. *Ball*, *W. W. R.* *Mess. Mth.* 21 (1892) 20-.
- nature and velocity, determination. *Fessenden*, *R. A.* *Science* 12 (1900) 740-.
- new theory. *Leray*, (*l'abbé*) —. *C. R.* 69 (1869) 615-.
- Newton's law, and the law of attraction. *Anderssohn*, *A.* (*sen.*) *Mt. Ostid.* 5 (1892) 71-.

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- physical theories. *Hall, T. P.* Iowa Ac. Sc. P. 3 (1896) 47-.
- present position of our knowledge. *Mousson, A.* Zür. Vjschr. 14 (1869) 167-.
- propagation with reference to time and space. *Gerber, P.* Z. Mth. Ps. 43 (1898) 93-.
- Riemann's theory. *Helm, G.* Z. Mth. Ps. 23 (1878) 261-.
- and rotation, mutual effects. *Häussler, J. W.* Exner Rpm. 23 (1886) 501-.
- , — (Häussler). *Lampe, E.* Exner Rpm. 23 (1887) 571-.
- , —. *Häussler, J. W.* Exner Rpm. 23 (1887) 719-.
- , — (Lampe). *Häussler, J. W.* Exner Rpm. 24 (1888) 60-.
- , — (Häussler). *Favero, G. B.* Rm. R. Ac. Linc. Rd. 4 (1888) (Sem. 1) 310-.
- , — (Häussler). *Lampe, E.* Exner Rpm. 24 (1888) 324-.
- as secondary electric effect, theory. *Fessenden, R. A.* [1900] Sc. Abs. 4 (1901) 8-.
- terrestrial. *Fontana, G.* [1798] Mod. S. It. Mm. 8 (1799) 124-.
- transformation. *Croll, J.* Ph. Mg. 2 (1876) 241-.
- velocity of propagation. *Hepperger, J. von.* Wien Ak. Sb. 97 (1889) (Ab. 2a) 337-.
- , —. *Preston, S. T.* Nt. 48 (1893) 108.
- , —, determination by Doppler's principle. *Mewes, R.* Dingler 315 (1900) 637-.
- Gravitational permeability. *Austin, L. W., & Thwing, C. B.* Ps. Rv. 5 (1897) 294-.
- Molecular physics, problem, contribution of astronomy to solution. *Pictet, R. A. C.* 25 (1882) 546-.
- Newton and action at a distance. *Kirwan, C. de.* Rv. Quest. Sc. 33 (1893) 169-.
- Potential energy. *Provenzali, F. S.* Rm. N. Linc. Mm. 4 (1888) 8-.
- Quartz crystals, directive action. *Poynting, J. H., & Gray, P. L.* [1898] Phil. Trans. (A) 192 (1899) 245-.
- Repulsion. *Heath, D. D.* Nt. 30 (1884) 490.
- Solar and planetary systems, electrical hypothesis for. *Delta.* Elect. Rv. 42 (1898) 72-, 138-, 283-, 460-, 491-; 43 (1898) 655.
- Force (energy) and matter, persistence. *Dreher, E.* Emden Nf. Gs. Jbr. (1891-92) 37-.
- Indicators and registering instruments, conditions necessary for. *Blondel, A.* C. R. 116 (1893) 748-.
- Marks on glass, method of making clear. *Martens, F. F.* A. Ps. C. 62 (1897) 206-.
- Measurements of precision, relation to condition of man. *Mendenhall, T. C.* J. H. Un. Cir. 13 (1893-94) 42-.
- Measuring instruments at the Philadelphia Electrical Exhibition. *Guérout, A.* Lum. Elect. 16 (1885) 7-.
- Metrological instruments. *Lehmann, C. F.* Z. Ethnl. 28 (1896) (438)-, (572).
- research, present state. *Lehmann, C. F.* Z. Ethnl. 26 (1894) (188)-.
- studies. *Wild, H.* [I.] St. Pét. Ac. Sc. Mm. 18 (1872) (No. 8) 26 pp.; 23 (1877) (No. 8) 22 pp.
- in British Museum. *Lehmann, C. F.* Z. Ethnl. 23 (1891) (515)-.
- Metrology. *Chisholm, H. W.* Nt. 8 (1873) 268-.
- , chapter in. *Grafstrom, E.* Am. Eng. & Railroad J. 72 (1898) 289-.
- , progress of science in. *Harkness, W.* Smiths. Misc. Col. 33 (1888) Art. 4, xxxix (bis)-. (Wash. Ph. S. Bll. 10 (1888).)
- Microscope in workshop. *Rogers, W. A.* Mcr. S. J. 6 (1886) 679-.
- — (testing planeness of surfaces). *Rogers, W. A.* Am. Mcr. S. P. 14 (1892) 128-.
- Modern measurements, refinement. *Brashear, J. A.* Sid. Mess. 9 (1890) 204-.
- Pressure, influence of small differences on results of accurate measurements and weighings. *Marek, W. J.* Carl Rpm. 17 (1881) 593-.
- Value of physical constants for Bucarest. *Negreanu, D.* Bucarest Ac. Rom. A. 19 (Pt. admin.) (1897) 390-; J. de Ps. 7 (1898) 425.
- Whitworth's planes, standard measures, and guns. *Tyndall, J.* R. I. P. 7 (1875) 524-.

## MEASUREMENT OF DYNAMICAL AND MECHANICAL QUANTITIES. ELASTICITY.

### 0800 General.

- Accurate straight edges, manufacture. *Wadsworth, F. L. O.* Franklin I. J. 138 (1894) 1-.
- Art of measuring. *Siemens, (Sir) C. W.* V. Nost. Eng. Mg. 15 (1876) 159-.
- Degree of accuracy of measures. *Macaluso, D.* Catania Ac. Gioen. At. 17 (1883) 173-.
- Errors in reading graduations. *Dorst, F. J.* Z. Instk. 6 (1886) 383-.
- Extremely small distances, appreciation. *Stoney, G. J.* Dubl. S. Sc. P. 7 (1891-92) 530-.

## 0805 Theory of Measurement (combination of observations). Harmonic Analysis. Units and Dimensions. Standards of Measurement.

### THEORY OF MEASUREMENT (COMBINATION OF OBSERVATIONS).

(See Mathematics 1630.)

### HARMONIC ANALYSIS.

- Perry, J.* Elect. 28 (1892) 362.
- Houston, E. J., & Kennelly, A. E.* Sc. Abs. 1 (1898) 471.
- Graphic method. *Hess, A.* Éclair. Élect. 5 (1895) 20-.
- Harmonic analyser. *Thomson, (Sir) W. R.* S. P. 27 (1878) 371-.

Harmonic analyser, new. *Henrici, O.* Gött. Nr. (1894) 30-; L. Ps. S. P. 13 (1895) 77-; Ph. Mg. 33 (1894) 110-.

—, reading amplitude and epoch directly. *Sharp, A.* L. Ps. S. P. 13 (1895) 89-; Ph. Mg. 33 (1894) 121-.

—, simple form. *Yule, G. U.* L. Ps. S. P. 13 (1895) 403-; Ph. Mg. 39 (1895) 367-.

— analysers, new. *Hess, A.* Éclair. Elect. 4 (1895) 385-.

New method. *Sharp, A.* L. Ps. S. P. 13 (1895) 599.

Polar-planimeter method. *Fensterwalder, S.* Z. Mth. Ps. 43 (1898) 85-.

Wave motion. *Lindelff, L. L.* [1873] Helsingf. Öfv. 16 (1874) 86-.

## UNITS AND DIMENSIONS.

- Bahia, M. B.* Arg. S. Ci. A. 29 (1890) 97-, 259-; 30 (1890) 21-, 81-, 161-, 241-.
- Absolute and gravitation systems. *Slate, F.* Nt. 44 (1891) 445.
- units. *Bohn, C.* [1882] A. Ps. C. 18 (1883) 346-; 20 (1883) 690-.
- (Bohn). *Volkman, P.* A. Ps. C. 19 (1883) 245-; 21 (1884) 516-.
- , *Moon, W.* B. A. Rp. (1891) 580; Tel. J. 28 (1891) 549-.
- , *Kistjakovskij, V.* Rs. Ps.-C. S. J. 25 (Ps.) (1893) 81-; J. de Ps. 3 (1894) 237.
- and measurement in mechanics. *Kiel, —.* Bonn Niedr. Gs. Sb. (1896) 80-.
- , reduction to fundamental units of time and length. *Sahulka, J.* Elekttech. Z. 11 (1890) 459-.
- , system. *Sundell, A. F.* [1881] Helsingf. Acta 12 (1883) 351-.
- , —. *Volkman, P.* A. Ps. C. 16 (1882) 481-.
- , —. *Lehmann, O.* Karlsruhe Nt. Vr. Vh. 13 (1900) (Ab.) 365-.
- , —, and dimensions of physical quantities. *Krebs, —.* Czgt. Opt. 10 (1889) 7-.
- , —, electrical units. *Géraldy, F.* Lum. Élect. 5 (\*1881) 181-, 216-.
- , systems. *Szarvady, G.* Lum. Élect. 14 (1884) 321-, 375-, 413-.
- , —. *Boulanger, J.* Lum. Élect. 16 (1885) 3-.
- , —. *Winter, W.* Exner Rpm. 24 (1888) 471-.
- Algebraic symbols in applied mathematics. *Lodge, O. J.* Nt. 43 (1891) 513.
- — —. *Macaulay, W. H.* Nt. 43 (1891) 558.
- C. G. S. and centimeter dyne second system of units, and a gravitational experiment. *Fessenden, R. A.* Science 22 (1893) 339-.
- — — system. (Correction of statements in *Everett's* book.) *Tittmann, O. H.* Nt. 45 (1892) 581.
- — — (Tittmann). *Everett, J. D.* Nt. 45 (1892) 581-.
- — —, fundamental units. *Stok, — van der.* Batav. Ntk. Ts. 47 (1887) 588-.
- — —, metre in. *Torre, M.* Rv. Sc.-Ind. 22 (1890) 252-.
- C. G. S. system, metric units of force, energy and power, larger than units of. *Thomson, (Prof.) Jas. B. A. Rp.* (1876) (Sect.) 32-.
- — — units. *Preece, W. H.* Elect. 21 (1888) 701-.
- Constants and units, report. *Guillaume, C. E.* B. A. Rp. (1892) 165-.
- , universal natural. *Thiesen, M.* D. Ps. Gs. Vh. (1900) 116-.
- Dimensional equations and change of units. *Shaw, W. N.* Camb. Ph. S. P. 5 (1886) 137-.
- , homogeneity in. *Clavenad, C.* C. R. 115 (1892) 470-.
- , — (Clavenad). *Vaschy, —.* C. R. 115 (1892) 597-.
- , and nomenclature. *Thomson, (Prof.) Jas. B. A. Rp.* (1878) 451-.
- , use. *Peddie, W.* Edinb. Mth. S. P. 9 (1891) 30-; 11 (1893) 7.
- Dimensions method, application to proof of physical theorems. *Neesen, F.* A. Ps. C. 7 (1879) 329-.
- of physical quantities. *Winter, W.* Exner Rpm. 21 (1885) 775-.
- — —. *Raverot, É.* Lum. Élect. 23 (1887) 101-; 36 (1890) 601-.
- — —, relation to directions in space. *Williams, W.* L. Ps. S. P. 11 (1892) 357-; Ph. Mg. 34 (1892) 234-.
- — —, suppressed. *Rücker, A. W.* [1888] L. Ps. S. P. 10 (1890) 37-; Ph. Mg. 27 (1889) 104-.
- — —, systems of, and laws of action. *Rovida, A.* Lum. Élect. 52 (1894) 601-.
- — —, theory. *Pietzker, F.* D. Nf. Vh. (1898) (Th. 2, Hälfte 1) 30-.
- , theory. *Sluginov, N. P.* (XII) Rs. Ps.-C. S. J. 16 (Ps., Pt. 1) (1884) 49-, 238-; Fsch. Ps. (1884) (Ab. 1) 28-.
- , —. *Abraham, H. J.* de Ps. 1 (1892) 516-.
- , —. *Schreiber, A. J.* de Ps. 8 (1899) 613-.
- of  $\mu$  and  $\kappa$ . *Fessenden, R. A.* Am. As. P. (1899) 115-; Ps. Rv. 10 (1900) 1-, 83-.
- — — (Fessenden). *P., W. A.* Elect. Rv. 46 (1900) 898-.
- Dynamical units (B. A. rep., 1873). *Everett, J. D.* B. A. Rp. 43 (1873) 222-.
- , —. *Smith, R. H.* Nt. 36 (1887) 53.
- , absolute, system. *Rovida, A.* Rv. Sc.-Ind. [24 (1892)] 153-.
- Electrical units and definitions. *Basso, G.* It. S. Met. An. 5 (1890) 131-.
- Elements of physical work:—*vis viva*, force, etc. *Nystrom, J. W.* Franklin I. J. 43 (1864) 325-.
- Energetics. *Ostwald, W.* Leip. Mth. Ps. B. 43 (1891) 271-; 44 (1892) 211-.
- Fundamental units. *Mendenhall, T. C.* Am. S. CE. T. 30 (1893) 120-.
- in absolute systems, change. *Malagoli, R.* Éclair. Élect. 11 (1897) 535-.
- — —, —. *Brylinski, E.* Éclair. Élect. 12 (1897) 60-.
- Gaussian units. *Abria, O.* [1882] Bordeaux S. Sc. Mm. 5 (1883) 15-.
- Germany, system of units for. *Anon.* (VI 626) Hann. Z. Arch. Vr. 6 (1880) 481-.

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- Homogeneity of formulæ. *Ledieu, A. C. H.* C. R. 96 (1883) 1692-.
- and physical equations. *Clavenad, —.* Gén. Civ. 28 (1893) 176-.
- in physical formulæ. *Bertrand, J. C. R.* 86 (1878) 916-.
- , reciprocity. *Ledieu, A. C. H.* C. R. 96 (1883) 1834-.
- M. K. S. system of units. *Rogers, F. J.* Ps. Rv. 11 (1900) 115-.
- Magnetic, gravitational and luminous force. *Chase, P. E.* [1875] Am. Ph. S. P. 14 (1876) 607-.
- quantities, dimensions. *Hospitalier, É.* [1887] Elect. 20 (1888) 163-.
- Mass and force units. *Newcomb, S.* Science 2 (\*1883) 493-.
- Micrometric unit (micron  $\mu$ ). *Cornet, —.* [1880] Brux. S. Blg. Mor. Bl. 6 (\*1882) cxvii-.
- Natural system of units. *Hauff, J. K. F.* Bode As. Jb. (1813) 228-.
- Nature, units of. *Stoney, G. J.* [1881] Dubl. S. Sc. P. 3 (1883) 51-.
- Notation for units. *Didion, I.* Metz Mm. Ac. 17 (1835-36) 227-.
- — —. *Macfarlane, —.* Cn. I. P. 3 (1886) 81-.
- Ostwald's system of units, and surface tension. *Schreber, K.* Ps. Z. 1 (1900) 75-, 165-.
- Physical quantities, mathematical classification. *Maxwell, J. C. L.* Mth. S. P. 3 (1869-71) 224-.
- Reduction of units to a single dimension. *Budde, E.* A. Ps. C. 20 (1883) 161-.
- Units. *Géraldy, F.* Lum. Elect. 3 (\*1881) 89.
- , *Guillaume, C. E.* [1900] So. Abs. 4 (1901) 475-.
- , systems. *Pionchon, J.* Bordeaux S. So. Mm. 2 (1891) 1-.
- , theory. *Ledieu, A. C. H.* C. R. 95 (1882) 1328-; 96 (1883) 986-.
- , —. *Szarvady, G.* Lum. Elect. 23 (1887) 401-.
- Value of physical constants in different systems. *Malagoli, R.* Rv. Sc.-Ind. 29 (1897) 269-.
- The watt and horse-power. *Preece, W. H.* Elect. 13 (1884) 473.
- Weight, mass, and dynamical units. *Hayward, R. B.* Nt. 35 (1887) 604-.
- , — force, units. *Greenhill, A. G.* Nt. 35 (1887) 486-.
- , — — —. *Geoghegan, E.* Nt. 35 (1887) 534; 36 (1887) 4.
- , — — —. *Lodge, A.* Nt. 35 (1887) 557.
- , — — —. *Elliott, A. C.* Nt. 35 (1887) 605-.
- , — — —. *Lock, J. B.* Nt. 36 (1887) 174.
- , — — —. *Macfarlane, A.* Nt. 36 (1887) 174-.
- , — — —. *Greenhill, A. G.* Nt. 36 (1887) 196-.

## Standards of Measurement 0805

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- Littman, E.* Stockh. Ak. Hndl. (1844) 17-.
- Chisholm, H. W.* Nt. 8 (1873) 268-.
- Jackson, L. d'A.* J. Sc. 21 (1884) 739-.
- Babylonian measure and weight and their variations. *Lehmann, C. F.* Z. Ethnl. 21 (1889) (245)-, (642)-.
- British standards. *Lucas, R. B.* [1885] S. Aust. R. S. T. 9 (1887) 18-.
- Burmese measure and weight. *Noelting, F.* Z. Ethnl. 28 (1896) (40)-.
- Comparison of standards of France, Russia and Great Britain. (With tables.) *Mendeleeff, D.* Par. Poids et Mes. PV. (1897) 155-.
- Cube, cylinder and sphere, Sir G. S. Evelyn's, remeasurement. *Kater, H.* Phil. Trans. (1821) 316-.
- Cubic inch and "loth"; cubic centimetre and gramme. *Bauer, K. L.* A. Ps. C. 133 (1868) 189-.
- Decimal measures. *Neilson, W.* (vi *Adds.*) Glasg. T. I. Eng. 1 (1857-58) 41-.
- metric system for Russia. *Petrusevskij, T. T.* Rs. Ps.-C. S. J. 25 (*Ps.*) (1893) 91-; *J. de Ps.* 3 (1894) 237-.
- and metric systems. *Penrose, F. C.* [1863] Br. Archt. I. Pp. (1864) 43-.
- system. *Walmesley, R. M.* Sc. S. Arts T. 13 (1894) 445-.
- — of 17th century. *Gore, J. H.* Am. J. Sc. 41 (1891) 22-.
- — with 1/16-inch as basis. *Holland, J. S.* (vi *Adds.*) Glasg. T. I. Eng. 1 (1857-58) 39-.
- —, link of Gunter's chain as unit. *Lyman, B. S.* Am. As. P. 15 (1866) 100-.
- — of weights, measures and coins, uniform. *Brown, S.* [1858] Assur. Mg. 8 (\*1860) 156-, 263-.
- Egyptian measures, ancient. *Girard, P. S.* (vi *Adds.*) Con. des Temps 14; (1806) 420-.
- — —, recent discoveries. *Anon.* (vi 152) Bb. It. 53 (1829) 200-.
- Fundamental standards of length and mass. *Mendenhall, T. C.* U. S. Coast Geod. Sv. Bl. No. 26 (1893) 1-.
- Great Pyramid, metrology. *Smyth, C. P.* Edinb. R. S. T. 23 (1864) 667-; 24 (1867) 385-.
- — —. *Wackerbarth, A. D.* [1868] Edinb. R. S. P. 6 (1869) 235-.
- — —. *Simpson, (Sir) J. Y.* [1868] Edinb. R. S. P. 6 (1869) 243-.
- — — (Wackerbarth and Simpson). *Smyth, C. P.* [1868] Edinb. R. S. P. 6 (1869) 316-.
- — —. *Smyth, C. P.* QJ. Sc. 1 (1871) 16-, 177-.
- — —. *Barnard, F. A. P.* Sch. Mines Q. N. Y. 5 (1884) 97-, 193-, 289-.
- — —. *Toitten, (Lt.) C. A. L.* V. Noat. Eng. Mg. 31 (1884) 226-.
- Metre and kilogramme. *Wrede, F. J.* [1872] Stockh. Bh. Ak. Hndl. 1 (1872-73) No. 3, 40 pp.

- Metre and kilogramme des Archives, copies. *Steinheil, C. A. von*. Münch. Gelehrte Anz. 8 (1839) 289-; Wien D. 27 (1867) (1<sup>re</sup> Ab.) 151-.
- — — — and standards of Conservatoire des Arts et Métiers, comparison. *Morin, A. J.* Par. A. Cons. 5 (1864) 5-.
- — — —, comparison, new method. *Lummer, O.* Berl. Ps. Gs. Vh. (1887) 5 (bis)-.
- — — —, mean temperature for. *Maus, H.* A. Cons. Arts et Mét. 10 (\*1873) 145-.
- — — — and second. *Zanotti Bianco, O. N.* Antol. Sc. 136 (1894) 476-.
- — — —, standard. *Stamkart, F. J.* Amst. Ak. Vs. M. 17 (1882) 74-.
- — — —, (Report.) *Amsterdam Koninklijke Akademie, Commissie.* Amst. Ak. Vs. M. 3 (1887) 280-.
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- Temperature correction of measurements. *Stadthagen, H.* Z. Instk. 15 (1895) 280-.
- , measuring instrument independent of. *Guillemot, —.* As. Fr. C. R. (1891) (Pt. 2) 192-.
- variations, measure of length unaltered by. *Soleil, H.* C. R. 69 (1869) 954.
- under presumably the same condition, importance in length standardisation. *Blair, H. W.* Science 1 (\*1883) 289-.
- Thermometers, comparison, in length standardisation. (Presidential address, Aug. 1887.) *Rogers, W. A.* Am. S. Mer. P. (1887) 5-.
- Thickness, etc., application of rotating disk or wheel to measurement. *Amster-Laffon, J.* Arch. Sc. Ps. Nt. 28 (1892) 362-.
- of cotton yarns, by microscope. *Turner, E. H.* Manch. Mer. S. T. (1889) 40-.
- measuring instrument, precise. *Halle, G.* Z. Instk. 16 (1896) 296-.
- wedge. *Schönemann, P.* A. Ps. C. 146 (1872) 612-.
- of quartz plate, optical constants for green mercury light. *Macé de Lépinay, J.* J. de Ps. 9 (1900) 644-.
- silvered glass, apparatus for measuring. *Ørsted, H. C.* Kiøb. Ov. (1844) 142-.
- , pachymeter for measuring. *Benoit, P. M. N.* Pogg. A. 2 (1824) 90-.
- Thin plates, measurement. *Sharp, C. H.* A. Ps. 3 (1900) 210-.
- Variation of length of bars under action of their own weight. *Silbermann, J. T.* C. R. 88 (1854) 825-.
- Vernier, application. *Oliveira, C. B. de.* [1854] Rv. Brazil. 1 (1857-58) 29-.
- for line or curve with unequal divisions. *Artur, J. F.* Par. Bl. S. Encour. 50 (1851) 676-.
- microscope. *Anon.* Mer. S. J. (1900) 509-.
- Wave-length of light as standard. *Govi, G.* [1871] Tor. At. Ac. Sc. 7 (1871-72) 115-.
- — — — —. *Michelson, A. A., & Morley, E. W.* Am. J. Sc. 88 (1889) 181-.
- — — sodium light as standard. *Michelson, A. A., & Morley, E. W.* Am. J. Sc. 34 (1887) 427-.
- lengths, angular, length and spectrometric measurements. *Michelson, A. A.* Am. J. Sc. 39 (1890) 115-; Nt. 49 (1893-94) 56-.
- and interferential methods in metrology. *Michelson, A. A.* Par. S. Ps. Sé. (1893) 155-.
- , measurement by. *Macé de Lépinay, J.* C. R. 100 (1885) 1377-; J. de Ps. 5 (1886) 405-; A. C. 10 (1887) 68-.
- , — — —. *Shaw, W. N.* Camb. Ph. S. P. 6 (1889) 100.
- , — — —. *Macé de Lépinay, J.* Par. S. Ps. Sé. (1893) 114-; A. C. 5 (1895) 210-.
- , — — —. *Perot, A., & Fabry, C.* C. R. 126 (1898) 1779-; A. C. 16 (1899) 289-.
- , — of cube in terms of. *Fabry, C., Macé de Lépinay, J., & Perot, A.* C. R. 128 (1899) 1317-.
- Wave lengths, value of standard metre in terms of. *Michelson, A. A.* C. R. 116 (1893) 790-.
- Wire gauge, standard. *Egleston, T., Metcalf, W., & Weeks, Jos. D.* [1877] Am. I. Mn. E. T. 6 (\*1879) 500-.
- , —, new British. *Anon.* Franklin I. J. 118 (1884) 95-.
- gauges. *Trotter, A. P.* Elect. 24 (1890) 8-.

## AREAS [and cross sections].

(See also Mathematics 0080, Instruments.)

- Areas, instrument for. (Tachymeter.) *Cairo, G.* C. R. 3 (1836) 140, 200, 245-, 384.
- , — — —. (—) *Bertini, M.* [1840] Lucca At. Ac. 11 (1842) 197-.
- , method of finding. *Wiener, A. E.* Dingler 311 (1899) 131-.
- , sources of error in measurement. *Louis, O. T.* Franklin I. J. 135 (1893) 83-.
- Cross section of solid body, determination. *Zets-sche, E.* Schlömilch Z. 4 (1859) 841-.
- — — wire, calculation in determination of electric resistances. *Isaachsen, D.* Arch. Mth. Ntvd. 12 (1888) 118-.
- sections and closed plane polygons. *Piton-Bressant, L. A.* Pon. Chauss. 4 (1892) 498-.
- , determination of surfaces. *Siegler, —.* A. Pon. Chauss. 1 (1881) 98-.
- , railway, graphic determination of areas. *Dubret, —.* V. Nost. Eng. Mg. 28 (1883) 1-.
- Curve and area integrating machine. (Panintegrimeter.) *Kohlmorgen, O.* Z. Instk. 16 (1896) 333-.
- Integrator, J. Amsler's, uses in naval architecture. *Amsler, A.* Nv. Archt. T. 25 (1894) 189-.
- Integrators, mechanical. *Hele Shaw, H. S.* I. CE. P. 82 (1885) 75-.
- Planimeter (pedimeter). *Schiereck, P. F.* Dingler 82 (1841) 251-.
- , *Ingram, E. L.* Sch. Mines Q. N. Y. 6 (1885) 347-.
- , Amsler's. *Schmidt, G.* Dingler 221 (1876) 87-; 222 (1876) 584-.
- , combined. *Kloht, F.* Z. Instk. 5 (1885) 41-.
- , history. *Wolf, R.* Zür. Vjschr. 37 (1892) 111-; 38 (1893) 3-.
- , Petersen's. *Lamotte, —.* Par. S. Ps. Sé. (1896) 82-.
- , polar. *Lieblein, J.* Grunert Arch. 88 (1862) 146-.
- , —. *Kajaba, J.* [1882] Wien Ak. Sb. 86 (1883) (Ab. 2) 635-.
- , —. *Hammer, E.* Z. Instk. 15 (1895) 90-.
- , —. *Bohn, C.* Z. Instk. 17 (1897) 54.
- , —, Hamann's. *Hammer, E.* Z. Instk. 16 (1896) 361-; 17 (1897) 96.
- , —, new control arm for. *Hammer, E.* Z. Instk. 17 (1897) 115-.

- Planimeter, polar, precision. *Lorber, F.* (xii) Z. Instk. 2 (1882) 327-, 345-, 425-.
- , sphere, new. *Hele Shaw, H. S. B. A. Rp.* (1888) 584-.
- Planimeters, construction. *Amsler-Laffon, J.* Z. Instk. 4 (1884) 11-.
- Quadrature, graphic method. *Collignon, É.* A. Pon. Chauss. 13 (1887) 9-.

## VOLUMES.

- Air and other substances, new instrument (physometer) for determining variable volume. *Harting, P.* Amst. Vs. Ak. 6 (1872) 288-; Arch. Néerl. 7 (1872) 289-.
- Balloon, symmetrically elongated, surface and volume. *Aimé, E.* Aér. (1889) 54-.
- Barrels, gauging. *Roca, E.* [1893] Gén. Civ. 24 (1893-94) 23-.
- , —. *Maitre, J.* Gén. Civ. 28 (1895-96) 380-.
- , —, nomographic method. *Pesci, G.* Gén. Civ. 35 (1899) 41-.
- Calibrating instrument, description. *Parrot, G. F.* Gilbert A. 41 (1812) 62-.
- Calibration, errors. *Handl, A.* Carl Rpm. 17 (1881) 295-.
- Cask, gauging. *Winter, F. de.* Brux. A. Tr. Pbl. 5 (1900) 938-.
- Cylinder. *Rasch, J. W.* N. Arch. Wisk. 7 (\*1881) 117-.
- Cylinders, approximate, instrument for volumes. *Neuhöfer, C.* Catg. Opt. 21 (1900) 1.
- , scale for gauging capacity. *Airy, G. B.* Ph. Mg. 8 (1879) 246-.
- Cylindrical vessel, calibration. *Kurz, A.* Exner Rpm. 20 (1884) 529-.
- Gas volumes, formulae for correction. *Zenneck, L. H.* Würzb. Jb. Ph. Md. Gs. 1 (1828) 159-.
- Graduated glass vessels, verification. *Casamajor, P.* C. N. 38 (1878) 157-, 171-.
- Interstitial space in mass of particles, crushed stone, etc. *Paret, T. D.* Franklin I. J. 140 (1895) 117-.
- Metallic spheres, volume and density. *Goyder, G. (jun.)* [1886] S. Aust. B. S. T. 9 (1887) 15-.
- Metric system, application to cooperage. (Report by *É. Mathieu.*) *Fournerie, —.* C. R. 35 (1852) 201-.
- Pipes, formula for volume. *Uhr, G. af.* Jern-Kont. A. 10 (1826) 14-.
- Ponds, cubic content. *Lempe, —.* N. Bergm. J. 2 (1799) 382-.
- , —. *Rötting, G. E.* Ing. 1 (1848) 74-.
- Reliability of measuring vessels. *Weinstein, —.* D. Nf. Vh. (1893) (Th. 2, Hälfte 1) 26-.
- Sections of tubes of small bore, calibration. *Pensky, B.* D. Nf. Vh. (1891) (Th. 2) 563-.
- Ships, tonnage. *Kramp, C.* Strasb. S. Sc. Mm. 1 (1811) 301-.
- , —. *Henderson, A.* (vi Add.) CE. I. P. 13 (1853-54) 1-; (iii) B. A. Rp. (1857) 62-.
- , —. *Avout, — d'.* C. R. 77 (1873) 872-.
- Ships, tonnage, English rules. *Dekke, A.* Nv. Archt. T. 9 (1868) 84-.
- , —, investigations with reference to laws for measurement. *Read, S.* Nv. Archt. T. 1 (1860) 121-.
- , — law as established in Merchant Shipping Act of 1854. *Moorsom, G.* Nv. Archt. T. 1 (1860) 128-.
- Solids, apparatus for. *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 3 (1894) (Sem. 2) 299-; Rv. Sc.-Ind. 27 (1895) 7-.
- , instrument for. *Smith, P.* Birm. Ph. S. P. 2 (1881) 350-.
- Stereometer, description. *Ventress, J. A.* Edinb. J. Sc. 7 (1827) 143-.
- , —. *Jeltnek, V.* Časopis 15 (1886) 119-; Fschr. Ps. (1885) (Ab. 1) 52.
- Stereometers, new forms. *Gee, W. W. H., & Harden, A.* Manch. Lt. Ph. S. Mm. & P. 4 (1891) 301-.
- Stones, heap, ratio of empty space to apparent volume, calculation. *Vinot, G.* Gén. Civ. 9 (1886) 133-.
- (road metal), measurement of heaps. *Delsaux, C. A.* Cond. Pon. Chauss. 28 (1884) (Pt. 1) 134-.
- Thermometer and other tubes, calibration. *Broch, O. J.* Par. Poids et Mes. Tr. Mm. 5 (1886) 82 pp.
- Timber, measurement. *Farey, J.* Tilloch Ph. Mg. 19 (1804) 218-.
- , —. *Gutteridge, W.* Tilloch Ph. Mg. 60 (1822) 418-.
- , —. *Wiseman, W.* Tilloch Ph. Mg. 61 (1823) 204-.

## ANGLES.

- Rochon, A. J.* de Ps. 74 (1812) 321-.
- Angular deviations, generalisation of Poggen-dorff's method for. *Piltchikoff, N. J.* de Ps. 8 (1899) 330-.
- Circle division, history. *Gelcich, E.* Z. Instk. 6 (1886) 158-.
- with 2 and 4 microscopes. *Schreiber, O.* Z. Instk. 6 (1896) 1-, 47-, 98-.
- Decimal division of quadrant. *Abbadie, A. d'.* C. B. 71 (1870) 335-; Nt. 29 (1884) 28-.
- system for angles. *Mialovich, K.* Wien Berg-Hm. Jb. 39 (1891) 323-.
- — —. *Ducrué, —.* D. Nf. Vh. (1899) (Th. 2, Hälfte 1) 283-.
- — — and time. *Rey-Pailhade, J. de.* Rv. Sc. 4 (1895) 83-, 315-; 6 (1896) 559-; 7 (1897) 15-; 12 (1899) 691-.
- — —. *Sarrauton, H. de.* Rv. Sc. 4 (1895) 205-; 6 (1896) 170-.
- — —. *Moch, G.* Rv. Sc. 5 (1896) 521-.
- — —. *E., A.* Rv. Sc. 6 (1896) 380-.
- — —. *Cornu, A.* Eclair. Elect. 11 (1897) 385-.
- — —. *Poincaré, H.* Eclair. Elect. 11 (1897) 529-.
- — —. *Rocca, J.* Rv. Sc. 7 (1897) 602-.

## 0807 Measurement of Angles

- Decimal system for angles and time. *Dufour, C.*  
*Laus. S. Vd. Bl.* 34 (1898) 367-.
- — — — — *Mehmke, R.* [1899] *D. Mth.*  
*Vr. Jbr.* 8 (1900) (*Heft* 1) 139-.
- — — — — *Bauschinger, J.* [1899]  
*D. Mth. Vr. Jbr.* 8 (1900) (*Heft* 1) 159-.
- — — — — *Schülke, A.* [1899] *D.*  
*Mth. Vr. Jbr.* 8 (1900) (*Heft* 1) 164-; *D. Nf.*  
*Vh.* (1899) (*Th.* 2, *Hälfte* 1) 282-.
- — — — — *Mendizábal Tamborrel, J.*  
*de. Méx. S. "Alzate" Mm.* 13 (1900) (*Mth.*  
*Suppl.*) 12 pp.
- — — — —, with tables for reduction.  
*Goedeels, —.* *Brux. S. Sc. A.* 23 (1899)  
*(Pt. 2)* 263-.
- Differences, small angular, measurement.  
*Langner, H. Z. Instk.* 6 (1896) 299-.
- Dividing engine (von Reichenbach's). *Liebherr,*  
*J. Gilbert A.* 67 (1821) 109-; 69 (1821) 320-.
- — — — — *Reichenbach, G. R. von. Gilbert A.* 68  
(1821) 33-.
- — — — — *Wegener, T. (xii) Z. Instk.* 3 (1883)  
117-.
- — — — —, automatic. *Saegmüller, G. N. Z.*  
*Instk.* 14 (1894) 84-.
- — — — —, Girgensohn's. *Lenz, E.* [1844] *St.*  
*Pét. Ac. Sc. Bl.* 3 (1845) 52-.
- — — — —, Ramsden's. *Wollaston, W. H. QJ. Sc.*  
12 (1822) 381-.
- — — — — engines. *Kuntz, —.* *A. Gén. Civ.* 7 (1868)  
816-.
- — — — —, Ramsden and early. *Watkins, J. E.*  
*Smiths. Rp.* (1890) 721-.
- Division of angles, apparatus for. *Rozé, —.*  
*Cg. Int. Chron.* (1900) 212-.
- Glass circle for angles. *Rutherford, L. M.*  
*Am. J. Sc.* 12 (1876) 112-.
- Goniograph, double reflecting. *Gelcich, E.*  
*Z. Instk.* 7 (1887) 93-.
- Goniometer, crystal, new. *Czapski, S. Z.*  
*Instk.* 13 (1893) 1-, 242-.
- — — — —, — adjustment for. *Schneider, E. Z.*  
*Instk.* 4 (1884) 242-.
- — — — —, new form. *O'Reilly, J. P.* [1872] *Ir. Ac.*  
*P. 1* (1873-74) 294-.
- — — — —, reflection-. *Rudberg, F. Stockh. Ak.*  
*Hndl.* (1826) 218-; *Kastner Arch. Ntl.* 10  
(1827) 461-.
- — — — —, —. *Brsch, (Dr.) [A.] A. Ps. C.* 129  
(1866) 384-.
- — — — —, —. *Lang, V. von.* [1875] *Wien Ak. D.*  
36 (1876) (*Ab.* 1) 41-.
- Instrument, new. (Pantogon.) *Domke, J. Z.*  
*Instk.* 20 (1900) 360-.
- Instruments for graduation. *Troughton, E.*  
*Phil. Trans.* (1809) 105-.
- — — — — (Troughton). *Cavendish, H. Phil.*  
*Trans.* (1809) 221-.
- Interferometer applied to small angles. *Wads-*  
*worth, F. L. O. Ps. Rv.* 4 (1897) 480-.
- Lorgnette goniométrique.* *Soret, J. L.* [1888]  
*Arch. Sc. Ps. Nt.* 21 (1889) 21-.
- Mirror method, magnification of measurement  
by. *Lermantoff, W. J. de Ps.* 10 (1891) 34-.
- — — — — reading, correction. *Schuster, A. Ps. Z.*  
1 (1900) 225-.
- — — — —, polyoptic. *Julius, W. H. Amst. Ak.*  
*Vs.* 6 (1898) 481-; *Z. Instk.* 18 (1898) 205-.

## Measurement of Time 0809

- Mirror and scale, measurement by. *Kohlrausch,*  
*F. A. Ps. C.* 31 (1887) 95-.
- Prisms, achromatic, doubly refracting, adapted  
for measurement of angles. *Rochon, A.*  
*J. de Pa.* 53 (1801) 169-.
- Reflecting measuring instruments. *Amici,*  
*G. B.* [1836] *Mod. Mm. S. It.* 21 (1837)  
142-.
- — — — —. *Čubr, E. Časopis* 2 (\*1873) 233-;  
*Fachr. Mth.* (\*1873) 553.
- Reflection methods for angles of altitude.  
*Koristka, K. Grunert Arch.* 27 (1856)  
275-.
- Repetition, measurement of angles by. *Four-*  
*cade, H. G. S. Afr. Ph. S. T.* 8 (1896)  
63-.
- Right angles, accuracy of instruments for  
production. *Lorber, F. Z. Instk.* 8 (1888)  
381-, 412-.
- Rotating divisions, method of reading. *Brod-*  
*hun, E. Z. Instk.* 17 (1897) 10-.
- Rotations, small, optical measurement. *Ray-*  
*leigh, (Lord). Ph. Mg.* 20 (1885) 360-.
- — — — —. *Wadsworth, F. L. O. Ph. Mg.*  
44 (1897) 83-.
- Solid angles, instrument for. *Weber, L. Z.*  
*Instk.* 4 (1884) 343-, 417-.
- Tachymeter, Charnot's. *Anon. A. Cond.*  
*Pon. Chauss.* 33 (1889) 521-.
- — — — —, Maury's. *Anon. A. Cond. Pon. Chauss.*  
42 (1898) 854-.
- — — — —, Sanguet's. *Anon. A. Cond. Pon. Chauss.*  
42 (1898) 769-.
- Telescope for horizontal and vertical angles.  
*San-Roberto, P. di. Rm. R. Ac. Linc. Mm.*  
2 (1878) 502-.
- — — — —, measurements by, influence of want of  
sphericity of objective. *Krtss, H. Z. Instk.*  
12 (1892) 199-.
- Theodolite, eccentric. *Vinton, F. L.* [1871]  
*Am. I. Mn. E. T. 1* (\*1871-73) 63-.
- — — — —, mining, new. *Frič, Jos., & Frič, Jan.*  
*Z. Instk.* 6 (1886) 221-, 305-.
- — — — — with new micrometer. *Heyde, G. Z.*  
*Instk.* 8 (1888) 171-.
- Theodolites, illumination. *Fennel, A. Z.*  
*Instk.* 8 (1888) 236-.
- — — — —, influence of eye-piece on errors. *Tinter,*  
*W. Z. Instk.* 8 (1888) 241-.

## 0809 Measurement of Time (mechanical and electrical); Chronometers.

(See also Astronomy 2100.)

- Absolute measurement by means of gravita-  
tional attraction. *Lippmann, G. C. R.* 128  
(1899) 1137-.
- — — — — unit of time determined by electrical stand-  
ards. *Lippmann, G. C. R.* 104 (1887)  
1070-.
- Chronodeisk, for finding time within a second.  
*Chandler, S. C. (jun.) Obs.* 4 (\*1881)  
14-.

## CHRONOGRAPHS.

(See also Mechanics 1650.)

- Schmidt, C. W. Cg. Int. Chron. (1900) 113-.
- and application to gun ballistics. *Watkin, (Col.) H.* [1896] R. I. P. 15 (1899) 176-.
- ballistic, Flamache *comparateur-régulateur* for. *Flamache, V.* Lum. Élect. 17 (1885) 583-.
- with centrifugal pendulum. *Rebeur-Paschwitz, E. von.* Z. Instk. 7 (1887) 171-.
- chronographic pendulum, Caspersen's. *Cochara, (capit.) L.* Rv. Artl. 20 (1882) 535-.
- and chronoscopes, control hammer for. *Külpe, O., & Kirschmann, A.* Ph. Stud. 8 (1893) 145-.
- , —, — (Külpe and Kirschmann). *Wundt, W.* Ph. Stud. 8 (1893) 653-.
- , electric. *Dumoncel, T. [A. L.]* Cherb. Mm. S. Sc. 1 (1852) 222-.
- , variable error, and controlling apparatus. *Cattell, McK.* Ph. Stud. 9 (1894) 307-.
- , —, — (Cattell). *Wundt, W.* Ph. Stud. 9 (1894) 311-.
- with controlling apparatus. *Lange, L.* Ph. Stud. 4 (1888) 457-.
- Dubocq and Mercadier. *Mercadier, E.* Lum. Élect. 4 (\*1881) 404-.
- electric. *Locke, J.* Silliman J. 8 (1849) 231-.
- , *Gibbs, W.* Am. As. P. (1854) 103-.
- , *Deprez, M.* C. R. 78 (1874) 1427-, 1562-; Par. S. Ps. Sé. (1874) 93-.
- , elimination of residual magnetism. *Smith, (Rev.) F. J.* Ph. Mg. 30 (1890) 160-.
- , new form. *Smith, (Rev.) F. J.* Ph. Mg. 29 (1890) 377-.
- measuring  $\frac{1}{1000}$  of a second. *Schmidt, W.* Par. S. Ps. Sé. (1891) 272-.
- new. *Dodge, R. Z.* Psychol. 10 (1896) 414-.
- phonograph used as. *Nansouty, M. de.* Gén. Civ. 19 (1891) 343-.
- photo-, polarising. *Crehore, A. C., & Squier, G. O.* [1895-96] Ps. Rv. 3 (1896) 63-; J. de Ps. 5 (1896) 83; 6 (1897) 37-.
- , —, *Baclé, L.* Gén. Civ. 29 (1896) 247-, 267-; 31 (1897) 136-.
- regulator for. *Anon.* Elekttech. Z. 11 (1890) 88-.
- simple. *Cole, A. D.* Denison Un. Sc. Lb. Bll. 5 (1890) 19-.
- , *Sanford, E. C.* Am. J. Psychol. 5 (1893) 385-.
- spark, Siemens and Halske. *Frölich, O.* (XII) Elekttech. Z. 1 (1880) 346-, 405-.
- special. *Lea, H., & Bragge, R.* B. A. Rp. (1894) 757-.
- traces, instrument for measuring. *Smith, (Rev.) F. J.* Ph. Mg. 32 (1891) 126-.
- with tuning-fork. *Webb, W. L.* Franklin I. J. 134 (1892) 219-.
- use of microphone to register swings of pendulum on. *Folie, F.* Brux. Ac. Bll. 18 (1887) 198-.
- Watkin.* *Ayrton, W. E.* Tel. E. J. 9 (1880) 121-.

## CHRONOMETERS.

- Arago, D. F. J.* (vi *Adds.*) Par. Bur. Long. An. (1824) 155-.
- Frodsham, W. J., & Parkinson,* —. Silliman J. 29 (1836) 297-.
- Rouyaux, J. A.* Rv. Mar. et Col. 51 (1876) 457-.
- Peters, C. F. W.* [1877] As. Nr. 91 (1878) 155-.
- adjustment for position. *Phillips, É. C. R.* 58 (1864) 287-, 363-.
- balance. *Ellis, R. L.* Camb. Mth. J. 4 (1845) 133-.
- , angular velocity. *Antoine, E.* Cg. Int. Chron. (1900) 208-.
- , best form. *Phillips,* —. Cg. Int. Chron. (1889) 13-.
- , "compound bars." *Berthoud, A. L.* Cg. Int. Chron. (1900) 187-.
- , isochronism. *Young, C.* Nicholson J. 12 (1805) 56-.
- , laws of rapid amplitude variation. *Brillouin, M.* Cg. Int. Chron. (1900) 164-.
- , spring and best escapement. *Rosé,* —. Cg. Int. Chron. (1889) 18-.
- , conical spiral, and other spirals. *Phillips, É.* Par. Éc. Pol. J. Cah. 49 (1881) 1-.
- , gilt. *Dent, E. J.* B. A. Rp. (1841) (pt. 2) 41.
- , glass. *Dent, E. J.* B. A. Rp. (1833) (pt. 2) 421; 4 (1835) (pt. 2) 595.
- , —, *Arnold, J. R., & Dent, E.* Silliman J. 32 (1837) 330-.
- , isochronism in connection with adjustments, laws. *Frodsham, C.* (vi *Adds.*) CE. I. P. 6 (1847) 224-.
- , spherical spiral. *Phillips, É. C. R.* 88 (1879) 1147-, 1234-.
- , spiral. *Phillips, É.* Par. Mm. Sav. Etr. 18 (1868) 129-.
- , —, new. *Phillips, É. C. R.* 78 (1874) 667-; 86 (1878) 26-.
- , —, non-symmetry of terminal curves. *Rosé, C.* C. R. 73 (1871) 1207-.
- , —, regulating. *Phillips, É.* Liouv. J. Mth. 5 (1860) 313-.
- , —, terminal curves. *Guillaume, C. É.* Cg. Int. Chron. (1900) 195-.
- , —, theorem. *Phillips, É. C. R.* 73 (1871) 1131-; 74 (1872) 581-.
- , —, with theoretical terminal curves, in 1877 competition. *Phillips, É. C. R.* 86 (1878) 1479-.
- , —, —, —, —, 7 years observations, Neuchâtel. *Phillips, É. C. R.* 73 (1871) 1069-.
- , springs, spiral, isochronism. *Caspari, E.* C. R. 81 (1875) 1122-; 83 (1876) 47-; Par. S. Ps. Sé. (1876) 22-; Cg. Int. Chron. (1889) 89-; (1900) 217-.
- , uncompensated. *Delamarche,* —, & *Ploix,* —. C. R. 48 (1859) 241-.
- banking of balance. *Hardy, W.* Tilloch Ph. Mg. 21 (1805) 181-.
- and clocks. *Bianchi, G.* Tortolini A. 5 (1854) 18-; 6 (1855) 40-.

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—, improvements. *Rittenhouse, D.* [1794] Am. Ph. S. T. 4 (1799) 28-.

—, rates. *Riddle, E.* [1828] As. S. Mm. 8 (1829) 215-.

—, —, *Pagel, L.* [1859] Reh. Chron. Cah. 5 (1861) 289-.

—, —, *(Pagel), Ploix, C.* Reh. Chron. Cah. 6 (1862) 375-.

—, —, variation (Lieussou). *Laugier, P. A. E. C. R.* 36 (1853) 894-.

—, —, —, *Lieussou, A.* Reh. Chron. Cah. 4 (1860) 216-.

—, —, rating. *T. (vi Adda.)* Tilloch Ph. Mg. 83 (1809) 402-.

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—, *Rosé, C.* C. R. 90 (1880) 807-, 858-.

—, *Cellérier, G.* Gen. S. Ps. Mm. 29 (1884-87) No. 6, 45 pp.

—, *Phillips, —.* Cg. Int. Chron. (1889) 62-; C. R. 109 (1889) 489-.

—, balance. *Hardy, W.* Nicholson J. 16 (1807) 120-.

—, effect of elasticity. *Phillips, É.* C. R. 67 (1868) 509-.

—, —, regulation. *Sang, E.* [1888] Sc. S. Arts T. 12 (1891) 183-.

—, —, Winnerl's. *Caspari, E.* C. R. 82 (1876) 894-.

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—, *Yvon-Villarceau, A. J. F.* C. R. 82 (1876) 531-, 590-.

indicating  $\frac{1}{1000}$ -second. *Schmidt, W.* Par. S. Ps. Sé. (1890) 243-.

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—, —, —, *Peters, C. F. W.* A. der Hydrog. 15 (1887) 505-.

—, —, —, pressure. *Harvey, G.* Phil. Trans. (1824) 372-.

—, —, —, *Yvon-Villarceau, A. J. F.* C. R. 82 (1876) 697-.

—, —, —, *Hülfiher, J.* As. Nr. 120 (1889) 109-; 122 (1889) 343-; Neuch. S. Sc. Bll. 17 (1889) 3-.

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—, —, induced magnetism of iron shell. *Harvey, G.* [1824] QJ. Sc. 18 (1825) 34-.

—, —, magnetism. *Lecount, P.* Edinb. Ph. J. 6 (1822) 238-.

—, —, —, *Harvey, G.* [1823-24] Edinb. Ph. J. 10 (1824) 1-, 342-; QJ. Sc. 17 (1824) 197-.

—, —, —, *Piddington, H.* Beng. J. As. S. 20 (1851) 61-.

—, —, —, *Boeddicker, O.* [1882] Dubl. S. Sc. T. 3 (\*1883-87) 1-.

—, —, —, *Le Goarant de Tromelin, (le lt.)* G. Rv. Mar. et Col. 88 (1886) 5-.

—, —, —, of balance. *Scoresby, (Rev.) W.* [1822] Edinb. R. S. T. (1823) 353-.

—, —, —, ships. *Delamarque, —, & Ploix, —.* C. R. 48 (1859) 462-; Reh. Chron. Cah. 6 (1862) 889-.

—, —, —, mode of suspension. *Thomson, (Sir) W.* Glasg. T. I. Eng. 10 (1867) 139-.

—, —, —, proximity of masses of iron. *Barlow, P.* Phil. Trans. (1821) 361-.

—, —, —, shocks on balance. *Antoine, —.* Cg. Int. Chron. (1889) 10-.

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—, —, simplified formulæ relating to. *Resal, H. A.* Mines 13 (1868) 301-.

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—, —, —, decimally graduated. *Guyon, E.* Cg. Int. Chron. (1900) 118-.

—, —, —, Dutch navy. *Kaiser, P. J.* Cg. Int. Chron. (1889) 146-.

—, —, —, with electrical record. *Hirsch, A.* Neuch. Bll. 7 (pt. 2) (1866) 431-.

—, —, —, French navy, history and report. *Rollet de L'Isle, —.* Rv. Mar. et Col. 99 (1888) 324-, 480-.

—, —, —, Grandjean's. *Hirsch, A.* Neuch. Bll. 6 (1861-63) 387-.

—, —, —, history and development. *Gardner, H. D.* [1890] Un. Serv. I. J. 84 (1890-91) 313-.

—, —, —, influence of atmospheric moisture. *Anon.* A. der Hydrog. 17 (1889) 107-.

—, —, —, iron. *Fisher, G.* Phil. Trans. (1820) 196-.

—, —, —, observations during voyage of "La Capricieuse." *Mouchez, E.* Reh. Chron. (1855) 1-.

—, —, —, —, voyages of the "Isis" and "Iphigénie." *Martin, (lt.) A.* Rv. Mar. et Col. 45 (1875) 385-.

—, —, —, —, protection. *Belli, G.* N. Cim. 5 (1857) 459-.

—, —, —, —, use. *Firminger, T.* Tilloch Ph. Mg. 42 (1813) 241-.

—, —, —, —, *Givry, —.* [1840] Reh. Chron. Cah. 2 (1859) 73-.

—, —, —, —, (de Magnac). *Yvon-Villarceau, A. C.* B. 75 (1872) 897-.

—, —, —, —, *Magnac, — de.* C. R. 77 (1878) 609-.

—, —, —, —, and their variation. *Magnac, A. de.* Cg. Int. Chron. (1889) 155-.

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—, various. *Urban, L.* As. Nr. 53 (1860) 241-.

—, and watches, influence of temperature. *Birkenmajer, L.* Krk. Ak. (Mt.-Prz.) Bz. 10 (1896) 357-; Crc. Ac. Sc. Bll. (1896) 78-.

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— in rarefied air. *Jürgensen, U.* Kiøb. Dn. Vd. Selsk. Afh. 4 (1829) xxiv-.

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— *Hartnup, J.* As. S. M. Not. 23 (1863) 170-; *Nt.* 8 (1873) 894-.

— *Magnac, H. J. A. de.* C. R. 81 (1875) 715-.

— *Faye, H. A. É.* C. R. 88 (1879) 1143-, 1291-.

— by signals. *Wauchope, R.* Edinb. N. Ph. J. 8 (1830) 160-, 289-.

regulation, and synchronising clocks. *Cornu, A.* Cg. Int. Chron. (1889) 176-.

— in vertical position. *Favre-Heinrich, M.* Cg. Int. Chron. (1900) 60-.

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— — — —. *Breguet, A. L.* Edinb. Ph. J. 1 (1819) 323-.

— — — —. *Barré, —.* Lille Tr. (1819-22) 1-.

— — — — (Barré's). *Delisle, —.* Lille Tr. (1819-22) 34-.

— — — —. *Bellavitis, G.* Ven. At. 5 (1846) 282-.

temperature coefficients. (Chronometer testing conference.) *Stechert, C.* A. der Hydrog. 24 (1896) 348-; 25 (1897) 330-.

— — — —. *Heuer, K., & Reinicke, (Kapt.) G.* A. der Hydrog. 26 (1898) 262-.

— — — —, calculation. *Stechert, C.* A. der Hydrog. 23 (1895) 388-.

— — — —, variation. *Börger, —.* A. der Hydrog. 11 (\*1883) 401-.

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— — — —, effect of form of balance. *Phillips, É.* C. R. 66 (1868) 526-.

— — — —, correction and temperature coefficients. *Anon.* A. der Hydrog. 19 (1891) 27-.

— — — —, use. *Esenbeck, (Kapt.) N. von.* A. der Hydrog. 17 (1889) 149-.

— — — —, corrections. *Nevins, A. E.* [1874-76] *As. S. M. Not.* 35 (1875) 79-; *Lpool. Lt. Ph. S. P.* 30 (1876) 227-.

— — — —. *Hartnup, J.* *As. S. M. Not.* 35 (1875) 314-.

— — — —, influence. (Memoirs, 1831, '32, '42, '44.) *Cornulier, — de.* *Rech. Chron. Cah.* 2 (1859) 87-; *Cah.* 3 (1859) 109-.

— — — —. *Börger, —.* A. der Hydrog. 6 (\*1878) 489-.

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— — — —. *Vanssay, P. de.* *Cg. Int. Chron.* (1900) 5-.

— — — —, Greenwich, 1823. *Hutton, G. F.* *Tilloch Ph. Mg.* 61 (1823) 177-.

— — — —, — and elsewhere. *Caspari, —.* *Cg. Int. Chron.* (1889) 23-.

— — — —, Kiel Observatory. *Peters, C. F. W.* A. der Hydrog. 3 (\*1875) 343-.

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— — — —, and amplitude of vibration. *Nyren, —.* *Cg. Int. Chron.* (1889) 153-.

— — — —, regulation. *Caspari, E.* *Cg. Int. Chron.* (1889) 67-.

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— *Marey, —.* *A. Cons. Arts et Mét.* 1 (1899) 283-.

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— — — —, determination of constants. *Decher, G.* *Dingler* 125 (1852) 12-.

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— — — —, and accessory apparatus. *Scripture, E. W.* *B. A. Bp.* (1897) 824-.

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— *Müller, Joh.* *A. Ps. C.* 189 (1870) 504-.  
—, electric. *Beetz, W.* *A. Ps. C.* 135 (1868) 126-.  
—, and experiments. *Müller, Joh.* [1868] *A. Ps. C.* 136 (1869) 151-.

- Clock- and instrument-makers, oil used by, improved preparation. *Moll, G.* *Hall Bij.* 1 (1826) 1-.  
— making. *Roussel, M.* *Amiens Mm. Ac. Sc.* (1841) 127-.  
—, application of mechanics. *Resal, H.* *A. Mines* 10 (1866) 423-; 11 (1867) 207-; 15 (1869) 211-; 18 (1870) 317-.  
—, toothed wheels. *Isely, (Prof.)* —. *Neuch. Bll.* 9 (1873) 381-.  
Clock-work for continuous uniform motion. *Jacobi, M. H.* [1846] *St. Pét. Ac. Sc. Bll.* 6 (1848) 104-.  
— — — — —. *Wagner, J. C. R.* 29 (1849) 701.  
—, electric. *Zetzsche, —.* *Elekttech. Z.* 5 (1884) 126-.  
— at Exhibition of 1889, machinery in manufacture. *Garnier, P.* *Cg. Int. Chron.* (1889) 38-.  
—, Units of chronometry. *Guillaume, C. É.* *Cg. Int. Chron.* (1900) 179-.  
— — — — —, report of Commission. *Faddegon, —.* *Cg. Int. Chron.* (1900) 184-.

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- Bessel, F. W.* *B. A. Rp.* (1842) (pt. 2) 1-; *As. Nr.* 20 (1843) 137-.  
*Förster, W.* *As. Nr.* 91 (1878) 337-, 353-, 369-.  
in air-tight case. *Förster, W.* *Carl Rpm.* 3 (1867) 271-.  
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astronomical. *Cesaris, G. A. de.* *Mil. Effem. As.* (1814) 74-.  
— *Hirsch, A.* *Neuch. Bll.* 5 (1859-61) 461-.  
— *Newcomb, S.* *Sid. Mess.* 3 (1884) 206-.  
—, equalisation of arcs. *Jürgensen, U.* *Kiöb. Dn. Vd. Selsk. Afh.* 1 (1824) 209-.  
—, Innsbruck. *Czermak, P.* *Innsb. Nt. Md. B.* 24 (1899) 193-.  
—, new. *Boys, C. V.* [1877] *As. S. M. Not.* 38 (1878) 74-.  
—, with pendulum governor. *Thomson, (Sir) W. R. S. P.* 17 (1869) 468-.  
—, regulation. *Hansteen, C.* *N. Mg. Ntvd.* 6 (1851) 30-.  
and atmospheric pressure. *Bessel, F. W.* *As. Nr.* 2 (1824) 49-.  
— — — — —. *Robinson, T. R.* *As. S. Mm.* 5 (1833) 125-.  
— — — — —. *Förster, W.* *Berl. Mb.* (1867) 239-.

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- and atmospheric pressure. *Hipp, M.* [1877] *Neuch. S. Sc. Bll.* 11 (1879) 152-, 159-.  
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— — — — —. *Robinson, T. R.* *B. A. Rp.* (1843) (pt. 2) 17-, 102.  
— — — — —. *Krüger, A.* *As. Nr.* 62 (1864) 279-; 68 (1867) 327-.  
— — — — —. *Airy, (Sir) G. B.* *Ph. Mg.* 41 (1871) 482.  
— — — — —. *Denison, E. B.* *As. S. M. Not.* 33 (1873) 122-, 294-.  
— — — — — (Denison's). *Robinson, T. R.* *As. S. M. Not.* 33 (1873) 295-.  
— — — — —. *Redier, A. C. R.* 83 (1876) 1174-.  
— — — — —. *Gulbransen, P. F.* *Belfast NH. S. Rp. & P.* (1890-91) 87-.  
— — error. *Webster, R.* *As. S. M. Not.* 33 (1873) 296-.  
*Breguet's Arago, D. F. J.* (vi *Adds.*) *Par. Bur. Long. An.* (1824) 152-.  
at Buda-Pest Polytechnic. *Kruspér, I.* [1885] *Mth. Term. Éts.* 4 (1886) 19-; *Mth. Nt. B. Ung.* 4 (1885-86) 18-.  
chronometric alarum. *Bianchedi, G.* (xii) *Rv. Sc.-Ind.* 6 (1874) 92-.  
church-, illumination. *Bryson, R.* *Edinb. N. Ph. J.* 33 (1842) 293-.  
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- Crosthwaite, J.* [1787] *Ir. Ac. T.* 2 (1788) 7-.  
*Döhler, J. F. A.* *Gilbert A.* 7 (1801) 318-.  
*Benzenberg, J. F.* *Voigt Mg.* 4 (1802) 697-.  
*Kater, H.* *Nicholson J.* 20 (1808) 214-.  
*Ward, H.* *Nicholson J.* 21 (1808) 53-.  
*B., R.* *Nicholson J.* 33 (1812) 217-.  
*Reid, A.* *A. C.* 85 (1813) 183-.  
*Ermerins, J. G.* *Leijd. A. Ac.* (1818-19) 22 pp.  
*Hüll, C. J. D.* (vi *Adds.*) *Lund Phys. Sällsk. Årsb.* (1823) 77-.  
*Berlinger, I.* *Wien Jb. Pol. I.* 6 (1825) 14-.  
*Herapath, W.* *Tilloch Ph. Mg.* 65 (1825) 374-.  
*Zecchini-Leonelli, —.* *Wien Jb. Pol. I.* 6 (1825) 53-.  
*Krajenhoff, H. E.* *Hall Bij.* 7 (1832) 351-.  
*Forman, W.* *Dingler* 55 (1835) 331-.  
*Jones, W. G.* *Silliman J.* 38 (1840) 274-.  
*Meikle, H.* *Edinb. N. Ph. J.* 41 (1846) 385-.  
*Laugier, P. A. E.* *C. R.* 25 (1847) 415-.  
*Smith, J. L.* *C. R.* 83 (1876) 202; *Am. J. Sc.* 12 (1876) 106-.  
*Weber, R.* *Neuch. S. Sc. Bll.* 15 (1886) 169-.  
*Nippoldt, W. A.* *Z. Instk.* 16 (1896) 44-.  
*Butenschön, G.* *Cztg. Opt.* 18 (1897) 61.  
*Faddegon, J. M.* *Cg. Int. Chron.* (1900) 13-.  
application of property of circle in construction. *Giulio, C. I.* [1848] *Tor. Mm. Ac.* 11 (1851) 187-.  
*Baily's Bryson, R.* *Edinb. N. Ph. J.* 38 (1845) 220-.

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- compound, of steel and zinc. *Lowe, E. J.* Manch. Ph. S. P. 1 (1857-60) 218-.
- Graham's. *Dienger, J.* Grunert Arch. 9 (1847) 338-.
- gridiron. *Benzenberg, J. F.* Gilbert A. 14 (1803) 315-.
- , of lead and iron. *Benzenberg, J. F.* Voigt Mg. 4 (1802) 787-.
- , new. *Nicholson, W.* Nicholson J. 3 (1800) 205-.
- height of mercury. *Lorenzoni, G.* Spet. It. Mm. 8 (1879) (App.) 1-.
- mathematical rules for construction. *Stevell, J. B. A.* Rp. (1836) (pt. 2) 7-.
- mercury. *Blacker, T.* [1806] Bode As. Jb. (1810) 221-.
- (Lowe's). *Firminger, T.* Tilloch Ph. Mg. 54 (1819) 102-.
- , *Baily, F.* As. S. Mm. 1 (1822) 381-.
- , *Encke, J. F.* As. Nr. 10 (1833) 119-.
- , *Böhm, J. G.* Wien SB. 26 (1857) 345-.
- , *Balázs, M.* Termat. Közl. 25 (1893) (Suppl.) 47-.
- , *Riefler, S.* Z. Instk. 13 (1893) 88-.
- and gridiron, comparison. *Kessels, —.* As. Nr. 27 (1848) 181-.
- of 2 pieces. *Sang, E.* [1867] Edinb. R. S. P. 6 (1869) 87-.
- simplest. *Huth, G.* Bode As. Jb. (1803) 218-.
- for temperature. *Nicholson, W.* Nicholson J. 1 (1797) 56-.
- — and atmospheric pressure. *Sang, E.* [1870] Edinb. T. Sc. S. Arts 8 (1872) 163-.
- — — — — *Oudemans, J. A. C.* As. Nr. 100 (1881) 17-.
- — — — — *Nippoldt, W. A.* Z. Instk. 9 (1889) 197-.
- zinc and steel versus mercurial. *Buckney, T.* As. S. M. Not. 46 (1886) 462-.
- construction. *Bloxam, J. M.* [1853] As. S. Mm. 22 (1854) 103-; 27 (1859) 61-.
- contact, new. *Braun, K.* (xii) Mth. Term. Éts. 1 (1883) 151-; Mth. Nt. B. Ung. 1 (1882-83) 119-.
- contact-maker, electric. *Grubb, H.* [1878] Dubl. S. Sc. P. 2 (1880) 115-.
- continuous motion, regulators for. *Leroux, F. P.* Par. A. Cons. 7 (1867) 595-.
- control, electric. *Hartnup, J. B. A.* Rp. (1857) (pt. 2) 13, 180-.
- , —, *Walker, C. V.* As. S. M. Not. 21 (1861) 72-, 160-.
- , —, *Hefner-Alteneck, F. von.* Nt. 48 (1893) 445-.
- , —, of turret clocks. *Kesel, G.* Cztg. Opt. 13 (1892) 249-.
- controlled electrically. *Henrich, F.* Humb. 3 (1884) 331-.
- for Copenhagen University. *Jürgensen, U.* As. Nr. 3 (1825) 1-.
- correction by means of telephone. *Norden-sköld, N. K.* Stockh. Öfv. 40 (1883) No. 4, 49-.
- with dead-beat escapement and deal pendulum, semi-arcs of vibration. *Squire, T.* Ph. Mg. 2 (1827) 84-.

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- diminution of friction. *Massey, E.* Tilloch Ph. Mg. 18 (1804) 305-.
- Dondi's, Padua. *Gloria, A.* Padova Ac. At. e Mm. 1 (1885) 233-.

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- Sharpe, R.* Ir. Ac. P. 3 (1847) 105-.
- Jaspar, J.* Brux. Ac. Bll. 20 (1853) (pte. 3) 281-.
- Jacobi, M. H.* [1856] St. Pét. Ac. Sc. Bll. 15 (1857) 25-.
- Barnard, F. A. P.* Am. As. P. (1858) 17-.
- Hirsch, A.* Neuch. Bll. 5 (1859-61) 591-.
- Cauderay, H.* Laus. Bll. S. Vd. 8 (1864-65) 246.
- Thomson, (Sir) W.* [1866] Glasg. Ph. S. P. 6 (1868) 61-.
- Arzberger, F.* Brünn Vh. 8 (1869) (Ab.) 91-; 9 (1870) (Ab.) 33-.
- Butkevich, F. S.* [1870] (xii) Mosc. S. Sc. Bll. 39 [No. 2] (1880) 11-.
- Brunn, J. A.* Ps. C. 157 (1876) 411-.
- Dumoulin-Froment, P.* A. Tél. 3 (1876) 345-.
- Gardner, H. D.* Nt. 20 (1879) 345-.
- Williot, —.* [1881] Bv. Sc. 2 (1882) 417-.
- Arzberger, F.* (xii) Z. Instk. 2 (1882) 51-.
- Magneville, — de.* Lum. Élect. 10 (\*1883) 244-.
- Hirsch, A.* Neuch. S. Sc. Bll. 14 (1884) 1-.
- Mauritius, —.* Exner Rpm. 20 (1884) 815-.
- Sartiaux, E.* Lum. Élect. 11 (1884) 91-.
- Tiede, —.* Elekttech. Z. 5 (1884) 251-.
- Rothen, —.* Bern Mt. (1886) x-.
- Favarger, A.* Gén. Civ. 12 (1887-88) 330-, 338-.
- Hirsch, A.* Neuch. S. Sc. Bll. 19 (1891) 3-.
- Braun, L.* [1894] Gén. Civ. 26 (1894-95) 3-.
- Hope-Jones, F.* [1899] I. Elect. E. J. 29 (1900) 119-, 286-.
- Sellaroli, A.* Rv. Sc.-Ind. 32 (1900) 206.
- of Berlin. *Kramer, A.* Dingler 121 (1851) 111-.
- calendar-. *Kleizner, R.* [1889] Termat. Közl. 22 (1890) 48-; Mth. Nt. B. Ung. 8 (1891) 456.
- , *Kleizner's.* Zetsche, E. Lum. Élect. 31 (1899) 419-.
- continuous motion, conical pendulum. *Thury, R.* Cg. Int. Chron. (1900) 146-.
- at Paris Exhibition, 1881. *Du Moncel, T.* Lum. Élect. 4 (\*1881) 337-.
- Philadelphia Exhibition. *Napoli, D.* Lum. Élect. 16 (1885) 314-.
- Řebíček's.* *Waltenhofen, A. von.* [1879] Prag Ab. 10 (1881) (Mth.) (No. 2) 6 pp.
- recording-. *Fuchs, K.* Elekttech. Z. 8 (1887) 342-.
- regulation. *Cauderay, H.* [1873] (ix) Laus. S. Vd. Bll. 12 (1874) 436-.
- regulator. *Tobler, A.* [1868] Laus. Bll. S. Vd. 10 (1868-70) 87-.
- , *Anon.* Tel. J. 15 (1884) 243-.
- self-regulating by the sun. *Dumoncel, T.* [A. L.] C. R. 42 (1856) 595-.
- signalling. *Elsässer, W.* Elekttech. Z. 18 (1897) 652.
- temperature compensation. *Ronalds, (Sir) F.* Tilloch Ph. Mg. 46 (1815) 203-.
- and time-telegraphs. *Spéllier, L. H.* Franklin I. J. 84 (1882) 111-.



- electricity applied to. *Gampel, C. G. Elect.* 3 (1883) 135-.
- electromagnetic. *Wheatstone, (Sir) C. R. S. P.* 4 (1848) 249-.
- , *Secchi, A. Palomba Rac.* 2 (1846) 353-.
- , *Brandt, W. T. R. I. P.* 1 (1851-54) 189-.
- equalization of arcs. *Hardy, W. Nicholson J.* 14 (1896) 367-; 21 (1898) 51-.
- for giving electric signals. *Pennock, H. W. Science* 3 (1884) 243.
- going-fusee, new construction. *Airy, G. B. [1849] Camb. Ph. S. T.* 7 (1842) 217-.
- with heavy pendulum, Nice Observatory. *Cornu, A. Cg. Int. Chron.* (1900) 47-.
- historic, at Courtraï. *Houzeau, J. C. [1885] Ciel et Terre* 6 (1885-86) 1-, 72.
- improvements. *Stampfer, S. Wien Jb. Pol.* 1 20 (1839) 78-.
- , *Clausen, T. [1844] St. Pét. Ac. Sc. Bil.* 3 (1845) 145-.
- , *Brit. Ass. Comm. B. A. Rp.* (1860) 56-.
- influence of attraction between weights and pendulum. *Reid, T. Nicholson J.* 33 (1812) 92-.
- — — — — *K., H. Nicholson J.* 34 (1813) 146-.
- — friction. *Sang, E. Edinb. N. Ph. J.* 19 (1835) 129-.
- — luni-solar attraction. *Gaillot, A. Bil. As.* 1 (1894) 217-; *C. R.* 98 (1884) 893-.
- — magnet. *Harvey, G. Edinb. J. Sc.* 6 (1827) 298-.
- — magnetic action. *Ellis, W. Ph. Mg.* 25 (1868) 325-.
- — temperature. *Boswell, J. W. Nicholson J.* 10 (1806) 70-.
- — —. *Brioschi, C. Mil. Effem. As.* (1812) 114-.
- irregularity due to electrification. *Baumgartner, A. von. Baumgartner Z.* 1 (1826) 299-.
- isochronous. *Reid, T. Tilloch Ph. Mg.* 45 (1815) 464-.
- Japanese, Science and Art Museum, Dublin. *Rambaut, A. A. [1889] Dubl. S. Sc. P.* 6 (1889-90) 332-.
- pendulum. *Walker, Ez. Tilloch Ph. Mg.* 36 (1810) 81-.
- , *Barnard, F. A. P. Am. As. P.* (1858) 17-.
- , advantages of small arc. *Sang, E. Edinb. N. Ph. J.* 15 (1833) 137-.
- , amplitude. *Walker, Ez. Nicholson J.* 2 (1802) 78-, 273-.
- , centrifugal. *Anon. (vi 629) Hermbstädt Bil.* 9 (1811) 350-.
- , —. *Clausen, T. Crelle J.* 5 (1829) 314-.
- , circular error. *Mohr, C. F. Dingler* 81 (1841) 89-.
- , clock, conversion of motion into equable motion of rotation. *Jones, R. L. As. S. M. Not.* 12 (1851-52) 150-.
- , Galileo's. *Schaik, W. C. L. van. Z. Instk.* 7 (1887) 350-, 428.
- , Harris's, erected in 1641; and rate of 2 clocks. *Reid, T. Tilloch Ph. Mg.* 45 (1815) 178-.
- pendulum clock, Huygens as inventor of. *Swinden, J. H. van. Amet. Vh.* 3 (1817) 27-; *Edinb. Ph. J.* 6 (1822) 197-; 7 (1822) 35-.
- , —, invention. *Wolf, R. Zür. Vjchr.* 32 (1837) 9-.
- , conical. *Foucault, L. C. R.* 25 (1847) 154-.
- , electrically maintained. *Fery, C. C. R.* 120 (1900) 1248-; *Cg. Int. Chron.* (1900) 69-; *As. Fr. C. R.* (1900) (Pt. 2) 467-.
- , —, Campiche. *Dary, G. [1900] Sc. Abs.* 4 (1901) 95-.
- , improvement. *Vernetil, —. Dijon Sé. Ac.* (1823) 50-.
- , isochronism. *Nippoldt, W. A. D. Nl. Vh.* (1896) (Tb. 2, Hälft. 1) 39-.
- , lengthening, without stopping clock. *Louvy, T. J. [1874] Calif. Ac. P.* 5 (1875) 426.
- , motion of support caused by. *Defforges, (le comm.) —. Cg. Int. Chron.* (1899) 191-.
- , rods of deal. *Walker, Ez. Tilloch Ph. Mg.* 33 (1809) 30-; 34 (1809) 3-.
- — — wood. *Baily, F. Tilloch Ph. Mg.* 65 (1825) 41-.
- , suspension. *Spellier, L. H. Franklin I. J.* 80 (1890) 47-.
- , testing motion. *Newcomb, S. (x) As. Nr.* 81 (1873) 319-.
- , tubular. *Troughton, E. Nicholson J.* 9 (1804) 225-.
- , —, Troughton's. *Schnitter, W. [1807] Bode As. Jb.* (1810) 184-.
- , in vacuo, use of corrections from arc. *Walker, Ez. Nicholson J.* 3 (1802) 35-.
- , variation in vibration. *Walker, Ez. Tilloch Ph. Mg.* 40 (1812) 293-.
- , of wood. *Beaufoy, M. Thomson A. Ph.* 15 (1820) 176-; 3 (1822) 406-; 11 (1826) 161-.
- — —. *Braddock, J. Madras J.* 7 (1838) 108-.
- pendulum's first application to. *Veladini, G. Mil. Mm. I. Lomb.* 5 (1856) 219-.
- — —. *Albèri, E. N. Cim.* 8 (1858) 369-.
- and pendulums, history. *Fossati, E. Rv. Sc.-Ind.* 23 (1891) 10-, 28-.
- pendulums, invariable. *Boswell, J. W. Nicholson J.* 10 (1806) 70-.
- , — (Boswell). *G., J. Nicholson J.* 15 (1806) 84-.
- perpetual, working by the tide. *Poultier, L. Cg. Int. Chron.* (1900) 193-.
- protection from variations of temperature and pressure. *Faye, H. A. É. C. R.* 25 (1847) 375-.
- rate adjustment. *Ellis, W. Obs.* 20 (1897) 411-.
- , in partial vacuum. *Carrington, R. C. [1872] As. S. M. Not.* 33 (1873) 51-.
- , — — (Carrington). *Robinson, T. R. As. S. M. Not.* 33 (1873) 121-.
- regulation. *Ball, R. S. [1877] Ir. Ac. P.* 3 (1883) 66-.
- , electric. *Ritchie, F. J. [1878] Sc. S. Arts T.* 10 (1883) 30-.
- , —. *Aron, —. Elekttech. Z.* 7 (1886) 353-.

## 0809 Clocks

regulation, electric. *Cornu, A. J. de Ps. 8* (1889) 101-.

—, —. *Wolf, —. Cg. Int. Chron. (1889) 188-*.

—, —. *Anon. A. Tél. 16 (1889) 848-*.

—, —. *Paris. Tresca, H. É. C. R. 90 (1880) 660-*.

— by telephone. *Rothen, —. J. Tél. 13 (1889) 98-*.

— — weights on pendulum, problem. *Isely, J. P. [1873] (x) Neuch. S. Sc. Bll. 10 (1876) 20-*.

regulator. *Destigny, —. Rouen Tr. Ac. (1825) 181-*.

of Royal Society, Edinburgh. *Robison, (Sir) J. Edinb. R. S. T. 11 (1831) 345-*.

in sealed case, at constant pressure. *Bigourdan, G. Cg. Int. Chron. (1900) 162-*.

sidereal, Greenwich. *Ellis, W. Nt. 11 (\*1875) 431-*.

— and mean time. *Dupuis, N. F. (xii) Cn. R. S. P. & T. 1 (1883) (Sect. 3) 75-*.

— — —. *Le Roy, A. As. Fr. C. R. (1894) (Pt. 2) 330-; Rv. Sc. 3 (1895) 348-*.

sounder for marking seconds. *Knipp, C. T. Am. J. Sc. 5 (1898) 289-*.

standard, of an electric system. *Henrich, F. Humb. 3 (1884) 372-*.

—, "make-and-break" apparatus for, and Jürgenassen's clock construction. *Konkoly, M. (xii) Mag. Tud. Ak. Étk. (Mth.) 8 (1881) (No. 8) 11 pp.*

stopping, due to oscillation of weight. *Howard, W. Silliman J. 8 (1824) 277-*.

Strasbourg Cathedral. *Fargeaud, A. Fr. Cg. Sc. (1842) (pte. 2) 113-*.

— —. *Raasche, G. Riga Cor.-Bl. 38 (1895) 67-*.

striking by electricity. *Bianchedi, G. Rv. Sc.-Ind. 16 (1884) 291-*.

— part regulated by pendulum. *Massey, E. Nicholson J. 8 (1804) 162-*.

sympathetic action of pendulums. *Smalley, G. R. N. S. W. R. S. T. 1 (1867) 78-*.

— influence. *Ellis, W. As. S. M. Not. 33 (1873) 480-*.

synchronisation. *Cornu, A. C. R. 105 (1887) 1106-; Par. S. Pa. Sé. (1888) 65-, 264-*.

synchronism between, by electric control. *Cornu, A. [1889] Dingler 276 (1890) 32-*.

and other time-measuring apparatus. *Gardner, H. D. Nt. 14 (1876) 529-, 554-, 573-; 15 (1877) 9-*.

— — — —, mechanical production. *Rodanet, A. H. Cg. Int. Chron. (1889) 59-*.

— time-signals, electric. *West, J. H. Elekt. tech. Z. 17 (1896) 2-*.

with torsion pendulum. *Douglas, W. H. B. A. Ep. (1888) 823.*

turret-, construction. *Grubb, H. Dubl. S. Sc. P. 4 (1885) 447-*.

—, remontoirs. *Denison, E. B. Camb. Ph. S. T. 8 (1849) 639-*.

uniform pressure-, new. *Buckney, T. As. S. M. Not. 40 (1880) 315-*.

with variable period, stroboscopic observation. *Brillouin, M. J. de Ps. 5 (1896) 394-*.

Wadham's galvanic remontoir-. *Lockey, F. Walker Electr. Mg. 1 (1845) 861-*.

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and watches, construction. *Reid, T. Nicholson J. 11 (1805) 1-*.

—, — (Reid). *M., R. (vi Adds.) Nicholson J. 15 (1806) 159-*.

— —, maintaining power. *Nicholson, W. Nicholson J. 1 (1797) 429-; 2 (1799) 49-*.

— —, pendulums and balances of, disturbance; theory of escapements. *Airy, G. B. [1828] Camb. Ph. S. T. 3 (1830) 105-*.

— — — —, influence of gravity. *X. Nicholson J. 22 (1809) 134-*.

— —, repeating. *Elliot, J. M. Nicholson J. 7 (1804) 157-*.

— —, 50 years' progress. *Gardner, H. D. Nt. 36 (1887) 392-, 484-*.

water-clock and gong in India. *Schlagintweit, H. von. Münch. Sb. (1871) 128-*.

winding by barometric changes, suggestion. *Wolse, C. A. [1849] Helsingf. Acta 3 (1852) 371-*.

and writing-telegraphy, etc., application of electric current. *Glasener, M. (vi Adds.) D. Nf. Vam. B. 33 (1857) 173-*.

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Coincidences, method. *Bichat, E. J. de Ps. 8 (1874) 369-*.

—, —. *Collet, J. [1891] Isère S. Bll. 27 (1892) 1-*.

—, —. *Perreau, E. J. de Ps. 8 (1899) 212-*.

Compensation of clocks, watches and chronometers. *Menon, —. Les Mondes 13 (1867) 654-*.

Dial of Achaas (*Horologium Achaas*). *Sachse, J. F. Am. Ph. S. P. 84 (1895) 21-*.

— for mean and solar time. *Gosselin, (col.) —. Metz Mm. Ac. 21 (1839-40) 396-*.

—, universal. *Böhm, J. G. Prag Sb. (1862) 57-*.

—, wooden suspension, used in Alps and Pyrenees. *Stanley, O. Edinb. N. Ph. J. 11 (1831) 281-*.

Dialling. *Lalande, J. le F. de. Par. Éc. Pol. J. 11<sup>e</sup> cah. (1801) 261-*.

—, —. *Gosselin, (col.) —. Metz Mm. Ac. 18 (1836-37) 109-*.

Electricity, use. *Förster, W. (xii) Elekttech. Z. 1 (1880) 229-*.

Electromagnetic time indicator. *Sturrock, W. [1892] Sc. S. Arts T. 13 (1894) 163-*.

Escapement. *Crosthwaite, J. [1787] Ir. Ac. T. 2 (1788) 7-*.

— for astronomical clock, Capt. H. Kater's. *Kater, E. Phil. Trans. (1840) 335-*.

—, chronometer-, applied to clocks. *Riefler, S. Dingler 276 (1890) 356-*.

—, clock-, with constant impulse. *Ainmiller, H. Dingler 260 (1886) 212-*.

—, —, dead beat (Graham's). *Bennett, J. Nicholson J. 15 (1806) 133-*.

—, —, —. *Vulliamy, B. L. QJ. Sc. 14 (1823) 334-; 16 (1823) 1-*.

—, —, new. *Whitelaw, D. Edinb. Ph. J. 8 (1823) 27-*.

—, —, —. *Airy, G. B. As. S. M. Not. 5 (1839-43) 221-*.

—, —, —. *Bond, R. F. (ix) Brünnow As. Not. (No. 21) (1860) 161-*.

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- Escapement, electromagnetic, Tiede's. *Förster, W.* Carl Rpm. 3 (1887) 271-.
- , free, with double wheel. *Jürgensen, U.* As. Nr. 1 (1823) 209-, 233-.
- , —, and free pendulum. *Appel, D.* Z. Instk. 12 (1892) 19-, 165.
- , —, — (Appel). *Westphal, A.* Z. Instk. 12 (1892) 164-.
- with free pendulum. *Witherspoon, A.* Edinb. N. Ph. J. 20 (1836) 303-.
- — —. *Riefler, S.* As. Nr. 134 (1894) 217-; Z. Instk. 14 (1894) 346-.
- , free, with reduced friction. *Jürgensen, U.* [1822] As. Nr. 1 (1823) 155-.
- , gravity-, clocks with. *Cinquemani, G.* Rm. N. Linc. Mm. 3 (1888) 91-.
- , —, detached. *Young, C. A.* Spet. It. Mm. 6 (1877) (App.) 73-.
- of Hipp chronograph, and measurement of small intervals of time. *Briggs, R.* Franklin I. J. 73 (1877) 89-.
- , new pendulum-. *Leman, —.* As. & Asps. 12 (1893) 882-.
- for standard clock. *Appel, D.* Z. Instk. 7 (1887) 29-.
- Escapements. *Reid, T.* Nicholson J. 5 (1802) 55-.
- *Veladini, G.* Mil. G. I. Lomb. 7 (1846) 127-.
- , chronometer-. *Rodanet, A. H.* Cg. Int. Chron. (1900) 84-.
- , —, classification. *Ditisheim, P.* Cg. Int. Chron. (1900) 40-.
- , clock-. *Wagner, J.* Par. Bil. S. Encour. 46 (1847) 3-.
- , —. *Denison, E. B.* [1848] Camb. Ph. S. T. 8 (1849) 633-.
- , —. *Fulton, J.* Silliman J. 11 (1851) 406-.
- , —. *Bloxam, J. M.* [1853] As. S. Mm. 22 (1854) 103-; 27 (1859) 61-.
- , compensations, etc., of clocks and chronometers, modern. *Antoine, E.* Cg. Int. Chron. (1889) 43-.
- Globe time-piece. *Allison, B.* Philad. T. 5 (1802) 82-.
- History of time-measurement. *Golfarelli, I.* Firenze Ac. Georg. At. 21 (1898) 237-.
- Horoscope, Eble's, theory (movable sundial). *Radau, R.* Les Mondes 8 (1865) 589-.
- Metronomes, construction. *Bruno, F. F. de.* Moigno Cosmos 7 (1855) 363-.
- Pendulum, electric motor. *Higgs, R. W. H. P.* [1876] Nt. 15 (1877) 98.
- , — precision-, Neuchâtel Observatory. *Favarger, A.* Lum. Élect. 20 (1886) 206-.
- , — regulator for. *Bourbouze, —.* C. R. 83 (1876) 482-.
- , free, as time standard. *Mendenhall, T. C.* Am. J. Sc. 43 (1892) 85-.
- , Helmholtz, modification. *Kleiner, A.* Arch. Sc. Ps. Nt. 8 (1899) 375-.
- Phenomena of the time-infinitesimal. *Nichols, E. L.* Am. As. P. (1893) 57-.
- Phonic wheel for regulating synchronism of motion. *La Cour, P.* C. R. 87 (1878) 499-; (xii) Sk. Nt. Môt. F. (1880) 133-; Tel. J. 21 (1887) 331-, 359-, 529.

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- Physical experiments, time measurements in. *Aldini, G.* Bologna Mm. I. It. 1 (pte. 2) (1806) 487-.
- Rotation time, absolute measurement. *Prytz, K.* A. Ps. C. 43 (1891) 638-.
- — of axis and vibration time of tuning fork, ratio. *Prytz, K.* A. Ps. C. 43 (1891) 652-.
- —, and periodic time of tuning fork, measurement. *Jones, J. V. L.* Pa. S. P. 10 (1890) 97-; Ph. Mg. 27 (1889) 349-.
- Small intervals, measurement. *Pouillet, C. S. M.* C. R. 19 (1844) 1384-.
- , —. *Tygna, E.* Rio Obs. Rv. (1886) 105-.
- , —, apparatus. *Aldini, G.* Bb. Un. 51 (1832) 77-.
- , —, —. *Hankel, W. G.* Leip. B. 18 (1866) 46-.
- , —, —. *Gieseler, E.* Bonn Niedr. Gs. Sb. (1875) 304-.
- , —; duration of electroscopic double refraction and magnetic rotation. *Abraham, H., & Lemoine, J.* Par. S. Ps. Sé. (1899) 155-; A. C. 20 (1900) 284-.
- , —, electrical. *Sabine, R.* Ph. Mg. 1 (1876) 337-.
- , —, photographic. *Stein, S. T.* Wien Ph. Cor. 14 (1877) 183-, 277-.
- , —, —. *Mareschal, G.* Gén. Civ. 20 (1891-92) 152-.
- , —, —. *Lavergne, G.* Gén. Civ. 21 (1892) 381-.
- Sundial, azimuthal. *Decante, —.* Rv. Mar. et Col. 46 (1875) 222-.
- , cylindrical, Mâcon. *Mayette, —.* Mâcon Ac. A. 5 (1885) 401-.
- , horizontal. *Donovan, M.* Ir. Ac. P. 7 (1858) 111-.
- , — elliptic, Dijon, 1827. *Perret, A.* N. A. Mth. 15 (1856) 399-.
- , —, —, —. *Dumay, —.* [1899] Dijon Ac. Sc. Mm. 7 (1901) xix-.
- , new. *Decohorne, —.* C. R. 113 (1891) 481.
- , portable. *Viala, E.* Mntp. Ac. Sc. Mm. 5 (1861-63) 155-.
- , — (Sonnenring). *Karsten, G.* [1893] Schl.-Holst. Nt. Vr. Schr. 10 (1895) 66-.
- , universal, Sharp's. *Robinson, T. R.* B. A. Rp. (1849) (pt. 2) 34.
- Sundials. *Littrow, J. J. von.* Baumgartner Z. 9 (1831) 148-.
- , adjustment. *Patterson, R.* [1817] Am. Ph. S. T. 1 (1818) 333-.
- , construction. *Francaeur, L. B.* Gergonne A. Mth. 8 (1817-18) 233-; 9 (1818-19) 91-.
- , —, graphical. *Kahrer, G.* Wien Jbr. Ober-Real. Sch. Inn. Stadt 5 (1863) 1-.
- , —, new method. *Servier, —.* Rv. Sc. 49 (1892) 366-.
- , globes for. *Avit, —.* Le Puy A. S. Ag. (1827) 189-.
- Telechronometer. *Ungerer, —.* Cg. Int. Chron. (1899) 189-.
- Telephonic time-transmitter. *Harrington, M. W.* Science 1 (\*1883) 302-.

- Temperature and time, measurement, analogy. *Macgregor, J. G.* [1887] N. Scotia I. Sc. P. & T. 7 (1890) 20-.
- Time determination in study of relative gravitation. *Saija, G.* Spet. It. Mm. 28 (1900) 65-.
- regulation, with alternating currents. *Bohmeyer, C.* Elekttech. Z. 8 (1887) 508-.
- signals, correction of errors in distribution. *Grubb, (Sir) H.* [1898] Dubl. S. Sc. P. 9 (1899-1902) 37-.
- , electric. *Carhart, H. S.* Science 3 (1884) 401.
- , —, method of making. *Mell, P. H.* (jun.) Science 2 (\*1888) 823.
- , —, —. *M.* Science 3 (1884) 59.
- , —, telegraphy. *Hirsch, A.* Neuch. Bll. 6 (1861-63) 373-.
- Watch with ball bearings for balance, trials. *Maillard-Salin, —.* Cg. Int. Chron. (1900) 63-.
- , rocking, rates of, and gravitational pendulum. *Barus, C.* Ph. Mg. 50 (1900) 595-.
- Watches, compensation curb. *Scott, J.* Nicholson J. 11 (1905) 19-.
- , —. *Hardy, W.* Nicholson J. 20 (1808) 138-.
- , magnetised. *Lewis, W. T.* Franklin I. J. 143 (1897) 60-.
- , mainspring, theory. *Young, Alex.* Franklin I. J. 24 (1852) 344-.
- , Paillard palladium alloys in. *Houston, E. J.* Am. Ph. S. P. 25 (1888) 129-.
- , Paillard's non-magnetic balance and hair-spring. *Houston, E. J.* Franklin I. J. 125 (1888) 238-.
- and other time-pieces, influence of magnetism. *Varley, S.* Tilloch Ph. Mg. 1 (1798) 16-.
- , trains. *Pearson, W.* Nicholson J. 5 (1802) 46-.

### 0810 Measurement of Mass and Density. Balance.

(See also Chemistry 7115.)

#### MASS.

- Francke, A.* Hann. Archt.-Vr. Z. 20 (1874) 539-.
- Air, weight of litre. *Broch, O. J.* Par. Poids et Mes. Tr. Mm. 1 (\*1881) A. 49-.
- , —, —, and density of gases. *Leduc, A.* C. R. 117 (1893) 1072-.
- , —, — (Regnault); water, density at 4° C. and at 0° C. *Kohlrausch, R.* Pogg. A. 98 (1856) 178-.
- , —, — millilitre. *Marek, W. J.* Par. Poids et Mes. Tr. Mm. 1 (\*1881) D. 26-.
- Carbon dioxide in air of weighing room. *Dobrochotov, A.* Rs. Ps.-C. S. J. 29 (Ps.) (1897) (App.) 85-.
- Coins, system of adjusting to standard in weight. *Smith, J. T.* Madras Eng. Rp. 2 (1846) 205-.
- Electricity, application to weighing. *Decharme, C.* Lum. Élect. 19 (1886) 15-.
- , free, influence on exact weighing. *Ekman, F. L.* Stockh. Öfv. 17 (1860) 279-.
- Gas weighed by Aristotle. *Erman, P.* Gilbert A. 16 (1804) 385-.
- Gases, weights, new method of determining. *Potter, J.* [1827] Manch. Ph. S. Mm. 5 (1831) 195-.
- Kilogramme, comparison of types, weighing observations. *Broch, O. J.* Par. Poids et Mes. Tr. Mm. 4 (1885) 1-.
- , standard III, volume. *Broch, O. J.* Par. Poids et Mes. Tr. Mm. 4 (1885) 23-.
- , —, weighings. *Dumas, J. B., et alii.* Par. Poids et Mes. Tr. Mm. 4 (1885) 1-.
- Metallic globules, minute, method of finding weight without balance. *Byrne, O.* (vi Add.) Chemist 5 (1844) 241-.
- Pendulum, weighing by means of. *Fuchs, K.* Exner Rpm. 26 (1890) 634-.
- Water, cubic decimetre, mass. *Fabry, C., Macé de Lépinay, J., & Pérot, A. C. R.* 129 (1899) 709-.
- , —, weight. *Wild, H.* A. Cons. Arts et Mét. 10 (\*1873) 106-.
- , —, —. *Mendeléeff, D.* R. S. P. 59 (1896) 143-.
- , —, —. *Chappuis, —.* Par. Poids et Mes. PV. (1897) 125-.
- , —, —. *Guillaume, C. É.* Par. Poids et Mes. PV. (1899) 143-.
- , —, foot, weight. *Hatty, R. J.* Par. S. Phlm. Bll. 1 (1791) 39-.
- , —, inch, weight. *Kupffer, A. T.* Erdm. J. Pr. C. 22 (1841) 62-.
- , distilled, cubic decimetre, mass at maximum density. *Macé de Lépinay, J. C. R.* 120 (1895) 770-; 122 (1896) 595-; Par. S. Ps. Sé. (1896) 191-; A. C. 11 (1897) 102-.
- , —, —, weight at maximum density. *Wild, H.* [1870] St. Pét. Ac. Sc. Bll. 15 (1871) 58-.
- , —, —, inch, weight. *Chaney, H. J.* [1892] Phil. Trans. (A) 183 (1893) 331-.
- , —, —, —; and specific gravity of air. *Rice, E. W. M.* Thomson A. Ph. 13 (1819) 339-; 14 (1819) 73-.
- , true weight. *Studer, J. G.* Gilbert A. 13 (1803) 122-.
- , weight, experiment. *Svanberg, J.* Stockh. Ak. Hndl. (1825) 1-; QJ. Sc. 22 (1827) 152-.
- Weighing, accurate. *Schuster, A.* Manch. Lt. Ph. S. Mm. & P. 7 (1893) 74-.
- , —. *Mendeléeff, D.* Rs. Ps.-C. S. J. 29 (Ps.) (1897) (App.) 1-; J. de Ps. 6 (1897) 613-.
- in air, correction. *Fontana, A.* N. Cim. 3 (1896) 324-.
- , art of. *Hansteen, C.* N. Mg. Ntvd. 6 (1851) 1-.
- , correction for buoyancy of air when volume is unknown. *Cooke, J. P.* Am. Ac. P. 18 (1883) 55-.
- , corrections. *Rühlmann, R.* Carl Rpm. 4 (1868) 177-.
- , —. *Bauer, K. L.* Carl Rpm. 4 (1868) 323-; 5 (1869) 332-.

- Weighing, corrections (Bauer). *Bühlmann, R.* Carl Rpm. 5 (1860) 820-.
- , direct determination of weight of displaced air. *Richarz, F.* Berl. Ps. Gs. Vh. (1886) 88 (bis)-.
- , limits of accuracy in ordinary. *Folkard, C. W.* C. N. 29 (1874) 20.
- , theory, formulae, constants and tables. *Marek, W. J.* Par. Poids et Mes. Tr. Mm. 3 (1884) D. 58-.
- in water, methods and results. *Marek, W. J.* Par. Poids et Mes. Tr. Mm. 1 (\*1881) D. 48-; 2 (\*1883) D. 58-; 3 (1884) D. 75-.
- Weighings, reduction. *Seidel, L., & Steinheil,* —. Münch. Gelehrte Az. 26 (1848) 301-.
- , — to vacuum. *Schottländer, P.* Z. Ps. C. 16 (1895) 458-.
- , — —. *Salomon, F.* Z. Angew. C. (1896) 529-.
- Weights, accuracy. *Dibbitts, H. C.* (xii) Mbl. Nt. 9 (1879) 120-.
- , best series. *Krönig, A. A.* Ps. C. 122 (1864) 598-.
- , correction-. *Verbeek, A. T. H.* Arch. Mth. Ps. 62 (1878) 388-.
- , new, description. *Prieur, C. A.* A. C. 20 (1797) 274-.
- , proposed new form. *Séguier, A., & Delamornière,* —. C. R. 44 (1857) 531-.
- , small, estimation. *McMayer, A.* Silliman J. 25 (1858) 39-.
- , variation by minute amounts. *Brown, J. A.* [1867] Edinb. R. S. P. 6 (1869) 167-.
- Thomson, T.* Thomson A. Ph. 15 (1820) 232-; 16 (1820) 161-, 241-.
- Hare, R.* Silliman J. 16 (1829) 293-.
- Regnault, V.* C. R. 20 (1845) 975-.
- Wagner, A.* (Chem.) Carl Rpm. 12 (1876) 60-.
- Chancel, G.* C. R. 94 (1882) 626-.
- Goldschmidt, H., & Meyer, V.* Berl. B. 15 (1882) 137-.
- Agamennone, G.* Rm. R. Ac. Linc. Rd. 1 (1885) 105-.
- Lux, F.* Fresenius Z. 25 (1886) 3-.
- Rayleigh, (Lord).* R. S. P. 43 (1888) 356-; 50 (1892) 448-; 53 (1893) 134-.
- Cooke, J. P.* Am. Ac. P. 24 (1889) 202-.
- Joly, J.* Dubl. S. Sc. P. 6 (1888-90) 534-.
- Geronzi, B.-T.* Rv. Sc.-Ind. 23 (1891) 228-.
- Moissan, H., & Gautier, H.* C. R. 115 (1892) 82-; A. C. 5 (1895) 568-.
- Meslans, M.* C. R. 117 (1893) 386-.
- Fresenius, W.* [1900] Nass. Vr. Jb. 54 (1901) XLII-.
- Air. *Agamennone, G.* Rm. R. Ac. Linc. Rd. 1 (1885) 111-.
- , densimeter for. [Barilli, G.] *Filopanti, Q.* Bologna Rd. (1867) 83-.
- Apparatus. *Schlassing, T.* (file) C. R. 126 (1898) 220-, 476-.
- for rapid determination. *Meslans,* —. Par. S. Phlm. Bll. 4 (1892) (C.R., No. 20) 2.
- Barothermometer. *Salomon, F.* Z. Angew. C. (1892) 45-.
- Bunsen's method, improvement. *Mendenhall, T. C.* Am. As. P. (1875) (Pt. 1) 112-.
- Correction for moisture. *Apjohn, Jas.* B. A. Rp. (1831-32) 570-.
- Dasymeter and air-pyrometer of Siebert and Dürr. *H.* Oestr. Z. Brgw. 41 (1893) 291-.
- for furnace gases. *Hauff,* —. Z. Vr. Rübenczuckin. 43 (1893) 399-.
- Gas and vapour densities. *Regnault, V.* A. C. 63 (1861) 45-.
- — —. *Bunsen, R. W.* A. C. Phm. 141 (1867) 273-.
- — —. *Mohr, C. F.* Bonn Sb. Niedr. Gs. (1869) 73-.
- — —, manometric estimation. *Müller, F. C. G.* Z. Angew. C. (1890) 513-.
- Gas-baroscope. *Bodländer, G.* Berl. B. 27 (1894) 2263-; Z. Angew. C. (1894) 425-.
- Gases at high temperatures. *Crafts, J. M.* C. R. 90 (1890) 309-.
- Immersed solids, measurement by. *Fitzgerald, G. F.* Dubl. S. Sc. P. 4 (1885) 481-.
- Influence of deformation of bulb. *Agamennone, G.* Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 80-.
- Manometric method. *Recknagel, G.* A. Ps. C. 2 (1877) 291-.
- Permanent gases. *Meyer, V.* Berl. B. 13 (1880) 2019-.
- Pitch of pipes, measurements by. *Jahoda, R.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 803-.
- Pressure of column of gas, apparatus for density of gases by measurement of. *Edelmann, M. T.* Carl Rpm. 17 (1881) 261-.
- Simple gases. *Zenneck, L. H.* Baumgartner Z. 3 (1835) 145-.

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- Littleton, N. L.* Md. Ps. J. 40 (1818) 269-.
- Schiff, H.* Lieb. A. 107 (1858) 59-.
- Tylden, W. A.* C. N. 38 (1878) 800-.
- Krebs, G.* Carl Rpm. 17 (1881) 661-.
- Lermantov, V. V.* Ra. Ps.-C. S. J. 17 (Ps.) (1885) 56-; J. de Ps. 5 (1886) 91.
- Sollas, W. J.* Nt. 43 (1891) 404-.
- Neufville, R. de.* Frkl. a. M. Ps. Vr. Jbr. (1891-92) 41.
- Hallock, W.* [1900] N. Y. Ac. A. 13 (1900-01) 476.
- Absolute density. *Sluginov, N. P.* Ra. Ps.-C. S. J. 19 (Ps.) (1887) 86-.
- Air, influence on density determinations and accuracy of weighings. *Demichel, A. A.* C. Anal. 8 (1898) 300-.
- Densities should be compared with that of water at maximum density. *Coze, J. R.* Thomson A. Ph. 7 (1816) 234.
- Density and specific gravity. *Lamy, A.* Lille Mm. S. (1853) 9-.
- Errors in determination. *Rose, G.* Pogg. A. 73 (1848) 1-.
- Practical rules for exact determination. *Kohlrausch, R.* Marb. Schr. 8 (1857) 1-.

## DENSITY OF GASES.

- Thomson, T.* Thomson A. Ph. 1 (1813) 177-.
- Gay-Lussac, L. J.* A. C. 1 (1816) 218-.
- Berzelius, J. J., & Dulong, P. L.* A. C. 15 (1820) 386-.

0810 *Density of Liquids*

## DENSITY OF LIQUIDS.

- Ramsden, J. A. C. 13 (1792) 243-.
- Strecker, Alex. (viii) Rpm. Phm. 25 (1827) 422-.
- Fownes, G. Phm. J. 2 (1843) 652-.
- Reischauer, C. [G.], & Vogel, A. Münch. Gelehrte Anz. 44 (1857) 436-.
- Tate, T. Ph. Mg. 17 (1859) 254-.
- Stgl, J. Rpm. Phm. 6 (1869) 234-.
- Sprengel, H. A. Ps. C. 150 (1873) 459-.
- Wright, C. R. A. S. C. In. J. 11 (1892) 297-.
- Zaloziecki, R. Z. Angew. C. (1896) 552-.
- Alcoholic solutions, Tralles's investigations. Windisch, K. Berl. Gandhamt. Arb. 9 (1894) 1-.
- Alcoholometer, Atkins's. Fletcher, J. Nicholson J. 2 (1802) 278-.
- Alcoholometers. Knoblauch, H. Halle Sb. Nf. Gs. (1859) 8-.
- Jacobi, H. St. Pét. Ac. Sc. Bil. 7 (1864) 320-.
- Müller, J. A. Par. S. C. Bil. 7 (1892) 492-.
- , Atkins's system. Jacobi, H. St. Pét. Ac. Sc. Bil. 7 (1864) 438-.
- , tables for. Tralles, J. G. Gilbert A. 38 (1811) 349-.
- Apparatus. Amat, L. Par. S. C. Bil. 45 (1896) 482-.
- Weber, L. Bresl. Schl. Gs. Jbr. (1888) 83-.
- for liquids at temperatures other than atmospheric. Hannay, J. B. C. S. J. 12 (1874) 203-.
- , new. Zambelli, L. [1888] Ven. I. At. (1888-89) 147-.
- , —. Salomon, W. N. Jb. Mn. (1891) (Bd. 2) 214-.
- , —. Lefebvre, M. Brux. S. Sc. A. 20 (1896) (Pt. 1) 108-.
- Areometric glasses, Wackenroder's, experiments with. Schrön, H. L. F. (xii) Arch. Phm. 79 (1842) 269-; 81 (1842) 124-.
- standard, necessity of common. Rubrom, M. Baumgartner Z. 7 (1840) 21-.
- Bareoscope for beet juice. Frič, J. Z. Zuckin. Böhm. 17 (1892-93) 98-.
- Blood, new method for. Haycraft, J. B. [1891] Edinb. R. S. P. 18 (1892) 251-.
- Closed space, liquid in. Stammkart, F. J. Amst. Vs. Ak. 5 (1871) (Ntk.) 175-; Arch. Néerl. 6 (1871) 217-.
- Densimeter, form. Chistoni, C. Mil. I. Lomb. Rd. 12 (1879) 318-.
- , Geissler's. Lefebvre, M. Czdg. Opt. 18 (1897) 174-.
- of liquid columns. Bertin, A. Erlenmeyer Z. 5 (1862) 33-; Strasb. S. H. Nt. Mm. 5 (Livre 2 & 3) (1862) 22 (bis)-.
- — —. Thury, —. [1892] Arch. Sc. Ps. Nt. 29 (1893) 102-.
- , pneumatic. Michaelis, H. (xii) Z. Instk. 3 (1883) 268-.
- Densiscopes, differential. Zantedeschi, F. Wien SB. 19 (1856) 237-.
- Density bottle. Campanile, F. N. Cim. 5 (1897) 183-.

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- Density bottle for liquids spontaneously inflammable in contact with air. Tribe, A. Ph. Mg. 46 (1873) 308-.
- — — tropical climates. Warden, C. J. H. C. N. 60 (1889) 236-.
- Determination of densities to 4 and 5 figures. Wackenroder, H. W. F. (xii) Arch. Phm. 124 (1853) 129-, 257-.
- Differential method of determination. Dittmar, W. C. N. 44 (1881) 51.
- Dilute aqueous solutions. Kohlrausch, F., & Hallwachs, W. Gött. Nr. (1893) 350-; A. Ps. C. 53 (1894) 14-, 1092.
- solutions. Kohlrausch, F. A. Ps. C. 56 (1895) 185-, 788.
- Efflux, density determined by rate of. Mohr, C. F. Pogg. A. 113 (1861) 158-.
- Glass beads, graduation, for densities of fluids. Ferguson, W. Dubl. J. Md. C. Sc. 2 (1833) 11-.
- Height of fluid columns, measurement by. Bohn, C. Exner Rpm. 22 (1886) 402-.

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- Speer, W. Tilloch Ph. Mg. 14 (1802) 151-, 229-.
- Barré, J. A. J. de Ps. 57 (1808) 433-.
- Hare, R. Silliman J. 11 (1826) 115-.
- Marozeau, —. J. Phm. 16 (1830) 482-.
- Roster, G. Sperim. 26 (1870) 59-.
- Hirsch, B. (xii) Arch. Phm. 209 (1876) 107-.
- (Werner.) Hirsch, B. (xii) Arch. Phm. 211 (1877) 16-.
- Casamajor, P. C. N. 37 (1878) 241-, 267-; 38 (1878) 3-.
- Plato, —. D. Nf. Vh. (1893) (Th. 2, Hälfte 1) 23-.
- accuracy. Demichel, A. Mulhouse S. In. Bil. 70 (1900) 277-.
- accurate, for any temperature. O'Toole, (Rev.) H. Dubl. S. Sc. P. 8 (1893-96) 753-.
- for alcohol and brandy, proposal by Commission. Stampfer, S. Wien SB. (1849) (Ab. 2) 304-.
- and alcoholometers, modification. Wildenstein, R. Fresenius Z. 1 (1862) 162-.
- barometric. Pillet, J. As. Fr. C. B. (1885) (Pt. 2) 246-.
- Baumé's. Bordier, M. Bil. Phm. 4 (1812) 151-.
- Neumann, A. Baumgartner Z. 3 (1835) 372-.
- Pemberton, H. Am. J. Phm. 18 (1852) 1-.
- Baudin, —. C. R. 68 (1869) 932-.
- Coulier, —. Mm. Md. Mil. 23 (1869) 368-.
- Chandler, C. F. Wash. Nat. Ac. Mm. 3 (Pt. 1) (1885) 63-.
- , for calculating quantity of sugar in solutions. Treviranus, L. G. Dingler 70 (1838) 36-; 74 (1839) 421-.
- , comparison of scale with density. Wigner, G. W. Anal. 5 (1880) 138-.
- , verification. Almeida, J. C. d', Berthelot, —, & Coulier, —. J. Phm. 18 (1873) 257-; C. R. 77 (1873) 970-.
- Beck's. Zenneck, L. H. Baumgartner Z. 2 (1833) 244-.

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Beck's, use instead of hydrostatic balance for liquids, theory to be applied in. *Trautwein, J. B. Lieb. A. 25 (1838) 337-*.  
 comparison of densities by various. *Gerlach, G. T. Dingler 198 (1870) 313-*.  
 constant volume. *Ruau, L. C. R. 45 (1857) 442-*.  
 construction and uses, with tables. *San Martino, G. B. da. Verona Mm. S. It. 7 (1794) 79-*.  
 and their correction. *Weinstein, B. Z. Ps. C. 7 (1891) 71-*.  
 correction and forms. *Guglielmo, G. Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 2) 341-; 9 (1900) (Sem. 1) 9-*.  
 — for temperature variation. *Casamajor, P. Mon. Sc. 19 (1877) 862-*.  
 of corvette "Witjaz," investigations with. *Makarov, S. O. Rs. Ps.-C. S. J. 23 (Ps.) (1891) 324-; J. de Ps. 1 (1892) 400-*.  
 for densities to '0001. *Planádvá, J. N. Baumgartner Z. 2 (1833) 41-*.  
 — which slightly exceed that of water. *Fellenberg, L. R. von. [1858] Bern Mt. (1859) 1-*.  
 Derham's. *Anon. Nt. 37 (1888) 497-*.  
 Dicas's Liverpool. *Pile, W. H. Am. Phm. As. P. 9 (1860) 216-*.  
 differential. *Fuchs, P. Z. Angew. C. (1898) 505-*.  
 —, of Fuchs. *Domke, —. Z. Angew. C. (1899) 370-*.  
 Fahrenheit's, modification. *Niemann, J. H. Lieb. A. 2 (1832) 357-*.  
 —, —; and new form of balance. *Guglielmo, G. Rm. R. Ac. Linc. Rd. 4 (1895) (Sem. 1) 77-; Rv. Sc.-Ind. 27 (1895) 205-; 28 (1896) 70-*.  
 form (*drijfbalans*). *Harting, P. Utr. Aant. Prv. Gn. (1849) 6-*.  
 glass, simple method of graduating. *Moore, C. Thomson A. Ph. 11 (1826) 261-*.  
 graduation, new method. *Pouillet, C. S. M. J. Phm. 36 (1859) 40-; C. R. 56 (1863) 888-*.  
 Imperial Normal-Standard Commission on. *Kaiserl. Normal-Messungs-Kommission. Z. Angew. C. (1890) 332-*.  
 improvements. *Arnim, L. A. von. Gilbert A. 1 (1799) 412-*.  
 —. *Meissner, P. T. Trommsdorff J. Phm. 22 (1813) 3-*.  
 inaccuracy. *Roster, G. Sperim. 25 (1870) 265-*.  
 influence of capillarity. *Langberg, C. (viii) Ps. Mdd. (1858) 1-; (iii) Pogg. A. 106 (1859) 299-*.  
 — —. *Jacobi, H. [1871] St. Pet. Ac. Sc. Mm. (Rs.) 20 (\*1872) (App. No. 4) 97 pp.; St. Pét. Ac. Sc. Mm. 17 (1872) (No. 5) 70 pp.*  
 — —. *Duclaux, E. J. de Ps. 1 (1872) 197-*.  
 — —. *Coulier, —. J. Phm. 23 (1876) 175-*.  
 — —. *Mensbrugge, G. van der. Brux. Ac. Bll. 16 (1868) 31-*.  
 — — and pressure of air. *Stamkart, F. J. Amst. Vs. Ak. 1 (1866) (Ntk.) 320-; Arch. Néerl. 1 (1866) 355-*.

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influence of dirt on surface. *Marangoni, C. (xii) Rv. Sc.-Ind. 12 (1880) 55-*.  
 international. *Spence, F. C. N. 55 (1887) 240-*.  
 invisible. *Parragh, G. Termt. Közl. 21 (1889) 121; Feschr. Ps. (1889) (Ab. 1) 339.*  
 manufacture. *Körner, F. Erdm. J. Tech. C. 5 (1829) 331-*.  
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 new. *Richter, J. B. Berl. Gs. Nt. Fr. N. Schr. 3 (1801) 329-*.  
 —. *Lavigne, —. Mntp. Rec. Bll. 4 (1811) 199-*.  
 —. *Alexander, —. Pogg. A. 70 (1847) 137-*.  
 —. *Sedlaczek, J. A. Ps. C. 158 (1876) 650-*.  
 —. *Dahm, G. Dingler 228 (1878) 235-*.  
 —. *Handl, A. Wien Ak. Sb. 92 (1886) (Ab. 2) 433-; 101 (1892) (Ab. 2a) 896-*.  
 —. *Láska, W. Z. Instk. 9 (1889) 176.*  
 — (modification of Láska's). *Aubel, E. van. Par. S. Ps. Sé. (1893) 235-*.  
 —. *Lezé, R. Rv. Sc. 52 (1893) 220-*.  
 —. *Lohnstein, T. Z. Instk. 14 (1894) 164-*.  
 —. *Vandevyver, L. N. Arch. Sc. Ps. Nt. 34 (1895) 409-*.  
 —. *Sandrucci, A. N. Cim. 6 (1897) 25-*.  
 normal. *Baumhauer, E. H. von. Pogg. A. 113 (1861) 639-; Arch. Néerl. 1 (1866) 338-*.  
 origin. *Salverte, E. A. C. 27 (1798) 113-*.  
 reading. *Marangoni, C. Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 657-*.  
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 —, arbitrary. *Piccini, A. (xii) Rv. Sc.-Ind. 6 (1874) 249-*.  
 — of equal divisions. *Gerlach, G. T. Fresenius Z. 5 (1866) 185-*.  
 with 2 scales. *Planádvá, J. N. Baumgartner Z. 2 (1833) 38-*.  
 scales. *Rauter, G. Z. Angew. C. (1897) 215-*.  
 —, adoption of uniform and invariable. *Witz, G. As. Fr. C. R. (1883) 355-*.  
 —, comparison. *Müller, (Dr.) J. Lieb. A. 31 (1839) 81-*.  
 —, —. *Gerlach, G. T. Fresenius Z. 4 (1865) 1-*.  
 —, construction and testing. *Schrön, H. L. F. (xii) Arch. Phm. 83 (1843) 1-*.  
 — for densities of liquids and volume of the kilogramme. *Jeannel, J. Bordeaux J. Md. 4 (1859) 31-*.  
 —, graduation, new mode. *Ricard, —. Caen Tr. (1811) 124-*.  
 —, —, —. *Smith, D. B. [1825] Philad. Coll. Phm. J. 2 (1831) 9-*.  
 —, — and testing. *Neumann, A. Baumgartner Z. 5 (1837) 76-*.  
 for sea water. *Schück, A. Z. Nw. 68 (1895) 437-*.  
 — —. *Thoulet, J. Rv. Mar. et Col. 124 (1895) 696-*.  
 — —, table for reduction of observations. *Tittmann, O. H. U. S. Coast Geod. Sv. Bll. No. 18 (1890) 175-*.

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- siphon-, to find temperature of water at maximum density. *Meikle, H.* Tilloch Ph. Mg. 68 (1826) 166-.
- , improved. *Meikle, H.* Ph. Mg. 4 (1828) 258-.
- siphon used as. *Meikle, H.* Edinb. N. Ph. J. 2 (1827) 366-.
- sources of error in using. *Fock, A.* Z. Ps. C. 2 (1888) 296-.
- standard. *Göckel, H.* Z. Angew. C. (1899) 712-.
- and stereometers. *Hachette, J. N. P.* A. C. 24 (1797) 833-.
- with temperature correction scale. *Fuchs, P.* Z. Angew. C. (1899) 15-.
- total immersion (Pisati system). *Reggiani, N.* Rm. R. Ac. Linc. Rd. 6 (1890) (Sem. 1) 99-.
- , —. *Warrington, A. W.* B. A. Rp. (1898) 791; Ph. Mg. 48 (1899) 498-.
- , —, variable inclination and reflection hydrometers. *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 9 (1900) (Sem. 1) 83-, 71-.
- Twaddle's. *Dingler, E. M.* Dingler 67 (1838) 147-.
- universal. *Lanier, —.* Bil. Phm. 4 (1812) 307-.
- use. *Malý, F.* Z. Instk. 12 (1892) 61-.
- for variable volume and constant weight. *Libert, —.* Finist. S. Sc. Bil. 6 (Fasc. 2) (1884) 50-.
- Hydrometric measurements in glass vessels, temperature correction tables. *Fuchs, P.* Z. Angew. C. (1898) 745-, 909-.
- Hydrometry. *Hassenfratz, J. H.* A. C. 26 (1798) 3-, 182-, 188-; 27 (1798) 118-; 28 (1798) 3-; 33 (1799) 3-.
- (Hassenfratz). *Schmidt, G. G.* Gilbert A. 4 (1800) 194-.
- *Descroizilles, —.* [1804] A. C. 58 (1806) 237-.
- *Bellani, A.* Mil. G. S. Inc. 1 (1808) 229-.
- *Delezenne, —.* Lille Tr. (1819-22) 48-.
- *Nobile, A.* [1829] Nap. At. I. Inc. 5 (1834) 79-.
- *Göckel, H.* Z. Angew. C. (1898) 867-.
- and the centigrade hydrometer. *Francaur, L. B.* C. R. 14 (1842) 828-; Par. Bil. S. Encour. 41 (1842) 181-.
- , formulæ of Tadini and Eytelwein. *Franchini, P.* (vii) Bb. It. 5 (1842) 73-.
- , graphic representation in. *Meinecke, J. L. G.* (viii) Rpm. Phm. 5 (1819) 175-.
- , sliding rod in. *Hare, R.* Tilloch Ph. Mg. 67 (1826) 266-.
- Instrument for density determinations. *Ham, F.* C. Gz. 2 (1844) 125.
- Liquid and gaseous carbon dioxide. *Heen, P. de.* Brux. Ac. Bil. 31 (1896) 379-.
- metals, density and thermal expansion of certain. *Vicentini, G., & Omodet, D.* [1887] Tor. Ac. Sc. At. 23 (1887-88) 38-.
- methane, oxygen and nitrogen. *Olszewski, K.* Krk. Ak. (Mt.-Prz.) Rz. 14 (1886) 181-, 197-; A. Ps. C. 31 (1887) 58-.

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- Liquids and bodies lighter than water. *Hockin, C., & Matthiessen, A.* Lb. 1 (1867) 189-.
- at their boiling points. *Schiff, R.* Berl. B. 14 (1881) 2761-.
- — higher temperatures. *Schiff, R.* Berl. B. 18 (1885) 1538-.
- Litrameter. *Hare, R.* (vi Add.) Ph. Mg. 4 (1828) 187-.
- Manometer, densities by. *Schiff, H.* Lieb. A. 121 (1862) 82-.
- Mercury, density at 0° C. *Volkman, P.* A. Ps. C. 13 (1881) 209-.
- , — in relation to barometric pressure. *Marek, W. J.* Par. Poids et Mes. Tr. Mm. 2 (\*1883) D. 18-.
- Method, new. *Cagnassi, M.* (xii) Rv. Sc.-Ind. 11 (1879) 169-.
- , —. *Sommerkorn, H.* Berl. B. 18 (1880) 143-.
- , —. *Sandrucci, A.* Rv. Sc.-Ind. 19 (1887) 65-.
- Oils. *Dudley, C. B., & Pease, F. N.* Am. Eng. & Railroad J. 69 (1895) 449-.
- Pyknometer. *Boot, J. C.* C. Ztg. 20 (1896) 616.
- , glass, with constant volume and precision adjustment. *Fuchs, P.* Z. Angew. C. (1898) 359-.
- , improved. *Voeller, F.* Z. Angew. C. (1891) 401.
- , —. *Squibb, E. R.* Am. C. S. J. 19 (1897) 111-.
- for light liquids. *Göckel, H.* Z. Angew. C. (1899) 1194-.
- measurements, temperature correction tables. *Fuchs, P.* Z. Angew. C. (1899) 25-.
- , small variation in. *Wiedemann, E. E. G.* A. Ps. C. 17 (1882) 983-.
- , Sprengel's, modification. *Minozzi, A.* Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 1) 450-.
- , Wiedemann's, modification. *Schulze, R.* A. Ps. C. 28 (1886) 144.
- Refraction of light, instrument for measuring by. *Mojon, G.* Genova Mm. S. Md. 1 (1802) 49-.
- Salinometer for measuring density of brine in marine steam boilers. *Russell, J. S.* Edinb. N. Ph. J. 34 (1843) 278-.
- Sea water. *Buchanan, J. Y.* R. S. P. 23 (1875) 301-.
- *Makarov, S. O.* Rs. Ps.-C. S. J. 23 (Ps.) (1891) 80-; Nt. 44 (1891) 359.
- *Anderson, W. S.* Sc. Gg. Mg. 10 (1894) 574-, 646.
- Variation of density produced by surface pressure in a liquid. *Monti, V.* Tor. Ac. Sc. At. 31 (1895) 150- or 194-.
- Viscous and frothy liquids. *Genieser, A.* Z. Angew. C. (1890) 44-.
- substances. *Brühl, J. W.* Berl. B. 24 (1891) 182-, 2455-.
- *Scheibler, C.* Berl. B. 24 (1891) 357-.
- Volumenometer, double, for liquids. *Marangoni, C.* N. Cim. 20 (1886) 112-; 6 (1897) 407-.
- Water. *Stampfer, S.* Wien Jb. Pol. I. 16 (1830) 1-.
- , pure, volume and density. *Broch, O. J.* Par. Poids et Mes. Tr. Mm. 1 (\*1881) A. 59-.



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- Tralles, J. G.* Gilbert A. 27 (1807) 261-  
*Rau, A.* Ac. Cass. Leop. N. Acta 9 (1818) 325-  
*Osann, G.* Pogg. A. 73 (1848) 605-  
*Laroque, F.* Toul. Mm. Ac. 6 (1850) 152-  
*Raimondi, A.* Pogg. A. 99 (1856) 639-  
*Dobbs, J. J., & Hutcheson, J. B.* Glasg. Ph. S. P. 15 (1884) 82-  
*Kleinstück, O.* Arch. Phm. 226 (1888) 166-; C. Ztg. 14 (1890) 233-  
*Leick, W.* N.-Vorp. Mt. 27 (1896) 96-  
*Negrescu, D.* Bucarest Ac. Rom. A. 22 (Pt. admin.) (1900) 72-  
 Absolute and specific weight of bodies in liquid.  
*Mohr, C. F.* Pogg. A. 112 (1861) 420-  
 ——— precipitates in liquids. *Fleck, H.* Pogg. A. 113 (1861) 160-  
 ——— (Fleck's method).  
*Mohr, C. F.* Pogg. A. 113 (1861) 655-  
 ——— *Kahl, E.* Schlömilch Z. 7 (1862) 456-  
 Adhesion, determinations affected by. *Tünnermann, J.* Trommsdorff N. J. Phm. 26 (1833) (St. 2) 93-  
 Alloys. *Matthiessen, A.* C. S. J. 5 (1867) 201-  
 Apparatus. *Eckfeldt, J. R., & Dubois, W. E.* Silliman J. 23 (1856) 294-  
 — *Fulton, H. B.* S. C. In. J. 11 (1892) 305-  
 —, portable. *Richards, J. W.* Berg-Hm. Ztg. 58 (1899) 327-  
 — for rapid determination. *Brown, M. W.* N. Eng. I. Mn. E. T. 36 (1887) 95-  
 Arabian determinations. *Wiedemann, E. E. G.* A. Ph. C. 20 (1883) 539-  
 Areometer, new (volumenometer). *Say, H.* A. C. 23 (1797) 1-  
 —, *Say's. Arnim, L. A. von.* Gilbert A. 2 (1799) 238-  
 —, —, improvement. *Miller, W. H.* Ph. Mg. 5 (1834) 203-  
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 Correction. *Osann, G.* Kastner Arch. C. 2 (1830) 58-, 371-  
 —, error in certain. *Mach, E.* Carl Bpm. 7 (1871) 377-  
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 — for powders. *Louis, H.* S. C. In. J. 13 (1894) 522-  
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 Gold coinage. *Brock, O. J.* N. Mg. Ntvd. 21 (1876) 363-  
 — in gold-silver alloys. *Louis, H.* [1893] Am. I. Mn. E. T. 22 (1894) 117-, 734-, 775-  
 Gravimeter, new, for weight and density of solids. *Bustamante, J. M.* Edinb. J. Sc. 10 (1829) 207-  
 Hydrometer, differential, for powders. *Fuchs, P.* Z. Angew. C. (1898) 623-  
 —, Nicholson's, improved. *Briffandon, —.* Lyon A. S. L. (1836) 15 pp.  
 — for solids. *Baumgartner, A. von.* Baumgartner Z. 1 (1826) 5-  
 ———. *Buignet, —.* J. de Ps. 9 (1880) 93-  
 ———. *Munroe, C. E.* Smiths. Misc. Col. 33 (1888) Art. 1, 26-. (Wash. Ph. S. Bll. 6 (1884).)  
 — — —, new form. *Failyer, G. H.* Kan. Ac. Sc. T. 11 (1889) 104-  
 Ice. *Osann, G.* Kastner Arch. C. 1 (1830) 95-  
 —, 0° to -20° C. *Brunner von Wattenwyl, C.* A. C. 14 (1845) 369-  
 —. *Dufour, L.* Bb. Un. Arch. 8 (1860) 89-; 14 (1862) 5-  
 —. *Nichols, E. L.* Ps. Rv. 8 (1899) 21-  
 Insoluble substances. *Symons, W. H.* Phm. J. 19 (1889) 205-  
 Instrument for densities. *Dunnington, F. P.* C. N. 41 (1880) 154-  
 — and weights. *Fox, R. W.* Cornwall Pol. S. Bp. (1847) 19-  
 — — —, without weights or calculation. *Adie, A.* Edinb. Mm. Wern. S. 3 (1817-20) 495-  
 —, new, for solids, by measuring water displaced. *Baddeley, (Lt.) —.* Silliman J. 18 (1830) 263-  
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 —, —. *Persoz, J.* Par. A. Cons. 5 (1864) 532-; C. B. 60 (1865) 405-  
 —, —. *Sonstadt, E.* C. N. 29 (1874) 127-  
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 —, apparatus for minute fragments. *La Touche, T. D.* Nt. 53 (1895-96) 199-  
 —, —, new. *Pisani, F.* C. B. 86 (1878) 350-  
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 — substances. *Rezow, N. A.* Fachr. Ps. (1889) (Ab. 1) 66-  
 — —, determination of density by enclosing in wax. *Aschauer, J. V.* Baumgartner Z. 4 (1837) 176-  
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 —. *Smeeth, W. F.* [1888] Dubl. S. Sc. P. 6 (1888-90) 61-  
 —. *Lenoble, E.* A. C. Anal. 3 (1896) 361-; 4 (1899) 44-  
 —. *Vandevyver, —.* A. C. Anal. 4 (1899) 2-  
 —, apparatus for. *Leslie, J.* QJ. Sc. 21 (1836) 374-  
 —, —. *Bremer, G. I. W.* Rec. Tr. C. P.-Bas 17 (1898) 263-, 404-

- Powders, heavy, small quantities. *Joly, J.* *Dubl. S. Sc. P.* 5 (1886-87) 41-.
- Pyknometer. *Berkeley, (Earl of).* [1895] *Mn. Mg.* 11 (1897) 64-.
- , modification. *Gintl, W. F.* *Fresenius Z.* 8 (1869) 122-.
- , —. *Kahlbaum, G. W. A.* *A. Ps. C.* 19 (1883) 378-.
- , physico-chemical. *Arpago, R.* *Rv. Sc.-Ind.* 25 (1893) 126-.
- Pyknometer. *Zenneck, L. H.* *Kastner Arch. Ntl.* 14 (1828) 81-.
- Salts soluble in water. *Andreae, J. L.* *J. Pr. C.* 30 (1884) 312-.
- — —. *Retgers, J. W.* *Z. Ps. C.* 3 (1889) 289-; 4 (1889) 189-; 11 (1893) 328-.
- Seeds. *Wolfenstein, O.* (xii) *J. Lndw.* 23 (1875) 401-.
- Soluble substances. *Del Lupo, M.* (xii) *Rv. Sc.-Ind.* 13 (1881) 161-.
- , new method for. *Zehnder, L. A.* *Ps. C.* 29 (1886) 249-.
- Sprengel's apparatus, modification. *Sollas, —.* *Dubl. S. Sc. P.* 5 (1886-87) 623-.
- Spring balance, densities by. *Creighton, H.* *QJ. Sc.* 13 (1822) 257-.
- Substances with large pores. *Guyton de Morveau, L. B.* *A. C.* 60 (1806) 121-.
- Volumenometer. *See* *Arsometer (Say).*
- Volumenometer. *Kopp, H. A. C.* 6 (1842) 380-.
- , *Raikow, P. C.* *Ztg.* 12 (1888) 525.
- , *Muraközy, K.* [1890] *Föl. Közl.* 21 (1891) 117-, 148-.
- , modified, application. *Kalecsinszky, S.* [1890] *Föl. Közl.* 21 (1891) 109-, 142-.
- , new. *Tschaplowitz [Chaplovits], F.* *Fresenius Z.* 18 (1879) 440-.
- , —. *Paalzw, C. A.* *A. Ps. C.* 13 (1881) 332-; 14 (1881) 176.
- , —. *Muraközy, K.* *Termt. Közl.* 25 (1893) (Suppl.) 33-.
- , —. *Myers, J. E.* [1893] *L. Ps. S. P.* 12 (1894) 372-; *Ph. Mg.* 36 (1893) 195-.
- , —. *Oberbeck, A.* *A. Ps. C.* 67 (1899) 209-.
- for powders. *Schumann, C. C.* *Ztg.* 8 (1884) 1778-.
- , simple form. *Linebarger, C. E.* *Am. C. S. J.* 21 (1899) 435-.
- and weighing apparatus, description. *Ångström, K.* *Stockh. Öfv.* (1895) 643-; *Fschr. Ps.* (1895) (Ab. 1) 24-.
- Volumenometers, new. *Baumhauer, E. H. von.* *Arch. Néerl.* 3 (1868) 385-.
- Wood. *Anon.* (vi) 1239 *Tilloch Ph. Mg.* 57 (1821) 366-.
- Yttrium, zirconium and erbium. *Meyer, S.* *Wien Ak. Sb.* 108 (1899) (Ab. 2a) 767-; *Mh. C.* (1899) 793-.
- DENSITY OF SOLIDS AND LIQUIDS.**
- Hare, R.* *Silliman J.* 11 (1826) 121-.
- Apparatus. *Nicol, W. W. J.* *C. N.* 47 (1883) 85-.
- , *Raikow, P., & Prodanow, N.* *C. Ztg.* 10 (1886) 1556.
- Areopyknometer with arbitrary scale. *Piccini, A.* (xii) *Rv. Sc.-Ind.* 11 (1879) 14-.
- Densimeter for solids and liquids. *Courtonne, H. J. de Ps.* 5 (1896) 315-.
- — — —, new. *Pâquet, E.* *Par. S. C. Bll.* 24 (1875) 51-.
- — — —, —. *Machado, V.* *Lisb. J. Sc. Mth.* 6 (1878) 285-.
- Formula for density. *Almeida, C. A. M. de.* [1879] *Lisb. J. Sc. Mth.* 7 (1880) 20-.
- Gravimeter for solids and liquids. *Guyton de Morveau, L. B.* *Nicholson J.* 1 (1797) 110-.
- Hydrometer for solids and liquids. *Atkins, G.* *Tilloch Ph. Mg.* 31 (1808) 254-.
- — — —, —. *Biervliet, — van.* *Brux. S. Sc. A.* 14 (1890) (Pt. 1) 60-.
- Hydrostatic weighings. *Lummer, O.* *Berl. Ps. Gs. Vh.* (1887) 65 (bis)-.
- , capillary influence. *Macé de Lépinay, J.* *J. de Ps.* 5 (1896) 266-.
- , difficulty. *Macé de Lépinay, J.* *J. de Ps.* 5 (1886) 416-.
- Ice and sea-water, density and volumes. *Ashe, W. A.* *Science* 10 (1887) 24.
- Instrument, new. *Nicholson, W.* [1785] *Manch. Ph. S. Mm.* 2 (1789) 396-.
- Method of determination. *Gentil, —.* *J. Phm.* 5 (1867) 401-.
- Pendulum, application. *Serra-Carpi, G.* *C. R.* 64 (1867) 659-.
- Pyknometer for volume and density of solids and liquids. *Bensemman, R.* *Rpm. Anal. C.* 7 (1887) 19-.
- Volumenometer for solids and liquids. *Kopp, H.* *Lieb. A.* 35 (1840) 17-.
- VAPOUR DENSITIES.**
- Couerbe, J. P.* *Bordeaux Act.* (1840) 5-.
- Sainte-Claire Deville, [É.] H.* *C. R.* 56 (1863) 729-.
- Pfaundler, L.* *Innsb. Nt. Md. B.* 1 (1870) 40-.
- Croullebois, M.* *C. R.* 78 (1874) 496-.
- (Croullebois.) *Sainte-Claire Deville, É. H.* *C. R.* 78 (1874) 534-.
- (Saint-Claire Deville.) *Croullebois, M.* *C. R.* 78 (1874) 805-.
- Brühl, J. W.* *Berl. B.* 9 (1876) 1368-.
- Hautefeuille, —, & Troost, —.* *C. R.* 83 (1876) 220-.
- Ciamician, G. L., & Goldschmidt, G.* *Wien Ak. Sb.* 75 (1877) (Ab. 2) 431-.
- Meyer, V.* *Berl. B.* 10 (1877) 2068-; 11 (1878) 1887-.
- Sainte-Claire Deville, É. H.* *C. R.* 84 (1877) 1256-.
- (Sainte-Claire Deville.) *Wurtz, C. A.* *C. R.* 84 (1877) 1347-.
- Hofmann, A. W.* *Berl. B.* 11 (1878) 1684-.
- Troost, L. J.* *C. R.* 86 (1878) 331-, 1394-.
- Piccard, J.* *Berl. B.* 13 (1880) 1079-.
- Dewar, J., & Scott, A.* *B. A. Rp.* (1881) 597.
- Meyer, V.* *Berl. B.* 15 (1882) 2775-.
- Pawlewski, B.* (xii) *Kosmos (Lw.)* 8 (1883) 93-; (x) *Berl. B.* 16 (1883) 1293-.
- Meyer, V.* *Berl. B.* 19 (1886) 1861-.
- Nilson, L. F., & Pettersson, O.* *A. C.* 9 (1886) 554-.
- Schall, C.* *Berl. B.* 20 (1887) 1435-, 1759-; 21 (1888) 100-.
- Bott, W.* *C. S. P.* 4 (1888) 110.

- Richards, T. W.* C. N. 59 (1899) 87-.  
*Krause, A., & Meyer, V.* Z. Ps. C. 6 (1890) 5-.  
*Schall, C.* Berl. B. 23 (1890) 919-, 1701-.  
*Lunge, G., & Neuberg, O.* Berl. B. 24 (1891) 729-.  
*Schall, C.* J. Pr. C. 50 (1894) 87-.  
*Winkler, L. W.* C. Ztg. 23 (1899) 627.  
 acoustic method. *Goldschmidt, H.* Berl. B. 13 (1890) 768-.  
 apparatus. *Grabowski, A.* A. C. Phm. 138 (1866) 174-.  
 — (in barometric vacuum). *Hofmann, A. W.* D. C. Gs. B. 1 (1868) 198-; 9 (1876) 1304-.  
 — *Bott, W., & Macnair, D. S.* Berl. B. 20 (1887) 916-, 1617.  
 — *Dyson, G.* C. N. 55 (1887) 88.  
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 — for determination by Gay-Lussac's method. *Warren, C. M.* [1866] Am. Ac. P. 7 (1868) 99-.  
 —, *Grabowski's*, modification. *Pfaundler, L.* D. C. Gs. B. 5 (1872) 575-.  
 —, *Hofmann's*, modification. *Wichelhaus, H.* D. C. Gs. B. 3 (1870) 166-.  
 —, —, *Engler, C.* Berl. B. 9 (1876) 1419-.  
 —, —, —, *Muir, M. M. P., & Suguira, S.* C. S. J. (1877) (2) 140-.  
 —, —, trough for. *Easterfield, T. H.* C. N. 60 (1889) 250-.  
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 —, —, of substances which attack mercury. *Pfaundler, L.* Berl. B. 12 (1879) 165-.  
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 — *Brown, J. T.* B. A. Rp. (1879) 304-.  
*Hofmann's* method. *Gabba, L.* Mil. I. Lomb. Rd. 2 (1869) 50-.  
 — *Tilden, W. A.* C. N. 37 (1878) 219.  
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 — — — at very high temperatures. *Meyer, C., & Meyer, V.* Berl. B. 12 (1879) 1112-.  
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 — — — for use under reduced pressure. *Richards, T. W.* C. N. 59 (1899) 89-.  
 — — — possible cause of error in. *Piccard, J.* [1891] Laus. S. Vd. Bll. 27 (1892) 265-.  
 — — — simplified. *Schwarz, H.* Berl. B. 16 (1883) 1051-.  
 — — — (Schwarz). *Meyer, V.* Berl. B. 17 (1884) 1334-.  
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*Pettersson and Ekstrand's* method, modification. *Schall, C.* Berl. B. 18 (1885) 2068-.  
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 — — —, apparatus for. *Eykman, J. F.* Berl. B. 22 (1889) 2754-.  
 — — —, V. Meyer's method. *Hoff, J. H. van't, & Romeny, J.* (xii) Mbl. Nt. 8 (1878) 135-.  
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 — — — in application of law of mixtures. *Hautefeuille, —, & Troost, —.* C. R. 83 (1876) 975-.  
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 — below their boiling points. *Demuth, R., & Meyer, V.* Berl. B. 23 (1890) 311-.  
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 — — — *Klobukow, N. von.* A. Ps. C. 22 (1884) 493-.  
 — — — — —, under reduced pressure. *La Coste, W.* Berl. B. 18 (1885) 2122-.  
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 — — — low boiling points. *Klobukow, N. von.* A. Ps. C. 22 (1884) 465-.  
 and temperature of experiment, simultaneous determination. *Nilson, L. F., & Pettersson, O.* Stockh. Ak. Hndl. Bh. 11 (1887) No. 6, 16 pp.  
 in vapour of phosphorus pentasulphide. *Knecht, W.* [1879] Lieb. A. 202 (1880) 31-.  
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*Peale, F.* Franklin I. J. 14 (1847) 59-.

*Wolke, C. A.* [1849] Helsingf. Acta 3 (1852) 413-.

*Carl, P.* Carl Rpm. 1 (1866) 7-.

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— large. *Mendelssohn, N.* Gilbert A. 29 (1808) 153-.

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— of knife edges. *Gauss, C. F.* As. Nr. 14 (1837) 241-.

—, machine for. *Hasemann, H.* Z. Instk. 14 (1894) 50-.

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analytical, damping arrangement. *Arzberger, F.* Lieb. A. 178 (1875) 382-.

—, —. *Geiger, —.* C. Ztg. 15 (1891) 476.

—, improvements. *Westphal, G.* Fresenius Z. 7 (1868) 294-.

apparatus for interchange of pans. *Classen, —.* Z. Instk. 15 (1895) 101-.

applications of principle. *Strait, H.* Silliman J. 27 (1835) 92-.

assay. *Botelho de Lacerda, C.* Lisb. Mm. Ac. Sc. 3 (1814) (pte. 2) 179-.

—, auxiliary. *Law, R.* C. S. J. 69 (1896) 526-.

—, improved. *Makins, G. H.* C. S. J. 6 (1854) 36-.

—, improvements. *Narci, C. P. T.* J. Mines 7 (1797-98) 455-.

—, recent. *Austin, L. S.* [1897] Colo. Sc. S. P. 6 (1897-1900) 34-.

automatic. *Weber, L.* [1893] Schl.-Holst. Nt. Vr. Sohr. 10 (1895) 309.

— exchange of pans. *Stadthagen, H.* Z. Instk. 20 (1900) 206-.

axis correction, etc. *Brauer, E. A.* (xii) Z. Instk. 2 (1882) 385-.

beam, best form. *Kernot, W. C.* [1880-94] Vict. R. S. T. 17 (1881) 19-; Vict. R. S. P. 7 (1895) 141-.

—, improved. *Arzberger, J.* Gilbert A. 46 (1814) 294-.

—, influence of bending. *Pierre, V.* Prag Sb. (1862) 13-.

—, short (Schickert's). *Hartig, T.* Dresden Sb. Isis (1871) 56-.

—, —. *Sartorius, F.* C. Ztg. 9 (1885) 1299.

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beams of aluminium. *Frerichs, F. T.* Lieb. A. 178 (1875) 365-.

—, Emery's support. *Schwirkus, G.* Z. Instk. 4 (1884) 261-.

— of steel, influence of magnetism. *Studer, J. G.* Gilbert A. 13 (1808) 122-.

chemical. *Dittmar, W.* (xii) Z. Instk. 1 (1881) 313-; 2 (1882) 68-.

—, *Hase, R.* Z. Angew. C. (1898) 736-.

—, effect of flexibility. *Proctor, B. S.* [1876] Newcastle C. S. T. 3 (1877) 183-.

—, new; theory of construction of balances. *Cooke, I. B.* Phm. J. 1 (1860) 360-.

construction. *Kater, H.* [1821] QJ. Sc. 12 (1822) 40-.

—, new methods. *Weber, W. E.* Gött. Cm. 8 (1832-37) (Ps.) 81-.

curve of accuracy. *Gallois, F. L. von.* Pogg. A. 116 (1862) 339-.

dead-beat. *Tait, P. G.* Edinb. R. S. P. 8 (1875) 490-.

delicate, construction. *Campbell, Jhn.* Calc. J. NH. 2 (1842) 842-.

—, suggestions on use. *Rayleigh, (Lord).* B. A. Rp. (1883) 401-.

for delicate weighing. *Braddock, J.* Madras J. 2 (1835) 86-.

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— — —. *Barnard, F. A. P.* Wash. Nat. Ac. Mm. 4 (Pt. 1) (1888) 203-.

— — —, new. *Thore, J.* Dax S. Borda Bll. (1887) 131-.

— of gases. *Lux, F.* Fresenius Z. 26 (1887) 38-.

— — — —, Lux's. *Anon.* C. N. 58 (1868) 4-.

— — — —, new. *Lux, F.* Fresenius Z. 29 (1890) 13-.

— — — —, solids and liquids. *Machado, V.* [1881] Lisb. J. Sc. Mth. 8 (1882) 97-.

— — — liquids. *Westphal, G.* Fresenius Z. 9 (1870) 233-.

— — — minerals and other solids heavier than water. *Parish, R.* Am. J. Sc. 10 (1875) 352-.

with double suspension. *Doulet, —.* A. Mines 9 (1836) 127-.

dynamical. *Duquoy, G. von.* Oken Isis (1824) 938-.

for elementary use. *Linebarger, C. E.* Am. C. S. J. 21 (1899) 31-.

estimation of small excesses of weight by, from time of vibration and angular deflection. *Poynting, J. H.* [1878] Manch. Lt. Ph. S. Mm. 7 (1882) 23-.

fish-rod. *Riddell, J. L.* Silliman J. 26 (1858) 71.

hydrostatic. *Fabbroni, G.* Siena At. Ac. 9 (1808) 133-.

—, *Barré, J. A.* Orléans Bll. 4 (1812) 273-.

— (Barré). *Ampère, A. M.* Par. Bll. S. Encour. 13 (1813) 77-.

—, *Desbordeaux, A.* Gaen Mm. Ac. (1849) 420-.

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- hydrostatic. *Buchanan, J. Y.* D. C. Gs. B. 4 (1871) 388-.
- , accurate form. *Joly, J.* [1886] *Dubl. S. Sc. P.* 5 (1886-87) 347-.
- , and adjuncts. *Sartorius, F.* Z. Instk. 13 (1893) 388-.
- , for densities of liquids. *Autenrieth, O.* *Dingler* 159 (1861) 109-.
- , experimental verification of principle of. *Pâquet, É.* J. de Ps. 10 (1891) 340-.
- , extremely cheap and delicate. *Ritchie, W.* *Edinb. J. Sc.* 5 (1826) 118-.
- , modifications. *Sartorius, F.* C. Ztg. 9 (1885) 1874-.
- , new. *Gerland, B. W.* S. C. In. J. 17 (1898) 13.
- , use. *Hirn, G. A.* A. Gén. Civ. 2 (1863) (pte. 2) 113-, 158-.
- Kuhlmann's.* *Gerland, B. W.* S. C. In. J. 14 (1895) 551-.
- technical. *Gerland, B. W.* S. C. In. J. 12 (1893) 995-.
- limit of accuracy at present attainable. *Seidel, L.* *Münch. Sb.* (1867) (2) 231-.
- magnetic, for weights. *Fox, R. W.* *Sturgeon A. Electr.* 1 (1836-37) 494-.
- mercury. *Horner, J. K.* *Gilbert A.* 68 (1821) 101-.
- for metallurgical purposes. *Rinman, C. (sen.)* *Jern-Kont. A.* 3 (1819) 106-.
- method of using with great delicacy. *Poynting, J. H.* [1878] R. S. P. 28 (1879) 2-.
- modification. *Mohr, C. F.* *Pogg. A.* 25 (1832) 266-.
- Mohr's*, densities determined by. *Demichel, —.* A. C. Anal. 5 (1900) 287-.
- , modification. *Guglielmo, G.* *Rv. Sc.-Ind.* 26 (1894) 177-.
- , and apparatus for volume of solids. *Guglielmo, G.* *Rm. R. Ac. Linc. Rd.* 3 (1894) (Sem. 2) 299-.
- must-, Oechsle, reliability. *Weigelt, C. H.* C. CB. 2 (1871) 604-.
- new. *Montu, —.* Par. S. Phlm. Bll. 1 (1797) 108-.
- *Tralles, J. G.* [1805] *Berl. Ab.* (1804-11) (*Mth.*) 65-.
- *Joule, J. P.* *Manch. Lt. Ph. S. P.* 5 (1866) 145, 165.
- *Mendelejeff, D. I.* *Les Mondes* 36 (1875) 335-.
- (*Mendelejeff's*). *Salleron, J.* C. R. 80 (1875) 378-.
- *Jäger, H.* *Carl Rpm.* 13 (1877) 288-.
- *Kruspér, I.* [1878] (xii) *Mag. Tud. Ak. Étk. (Mth.)* 6 (1879) (No. 6) 20 pp.; (x) A. Ps. C. Beibl. 4 (1880) 638-.
- *Pellat, —.* Par. S. Ps. Sé. (1889) 93.
- (*pondérateur*). *Serrin, V.* Par. S. Ps. Sé. (1890) 106.
- arrangements for. *Bunge, P.* Z. Instk. 14 (1894) 131-.
- form. *Bunge, P.* *Carl Rpm.* 3 (1867) 269-.
- (Roberval). *Picart, A.* C. R. 96 (1883) 1782-; 97 (1883) 86-, 252.
- *Phillips, H. J.* C. N. 72 (1895) 16.

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- new form, and its adjustment. *Girgensohn, T.* *St. Pét. Ac. Sc. Bll.* 5 (1839) 177-.
- forms, *Nemetz's.* *Pensky, B.* Z. Instk. 12 (1892) 221-; 14 (1894) 325.
- oscillation. *Stamkart, F. J.* *Amst. Vh.* 1 (1849) 68-.
- *Mendeleeff, D.* R. S. P. 63 (1898) 454-.
- and equilibrium. *Thiesen, M.* *Par. Poids et Mes. Tr. Mm.* 5 (1886) 40 + xxxiii pp.
- period, means for reducing. *Verbeek, A.* *Dingler* 804 (1897) 156-.
- , theory. *Anon.* *Dingler* 307 (1898) 225-, 249-.
- platform. *Hoffmann, C.* *Pogg. A.* 64 (1845) 817-.
- *Endlweber, J.* *Carl Rpm.* 15 (1879) 607-.
- of precision. *Sacré, É.* *Brux. Ac. Bll.* 12 (1845) 17.
- *Arzberger, F.* *Brünn Vh.* 14 (1875) (*Ab.*) 157-.
- *Redon, L.* *As. Fr. C. R.* (1878) 315-.
- *Serrin, V.* C. R. 112 (1891) 1299, 1480.
- *Leick, —.* N.-Vorp. Mt. 26 (1895) xvi.
- , adjustments and suspensions. *Sauter, A.* *Cztg. Opt.* 15 (1894) 232-.
- , Bunge's, theory. *Bunge, P.* *Cztg. Opt.* 5 (1884) 220-, 229-.
- , construction and adjustment. *Schultze, P.* Z. Instk. 12 (1892) 97-.
- , — verification, *Brauer's* methods. *Lermantov, V. V.* (xii) *Rs. C. Ps. S. J.* 9 (*Ps.*) (1877) [(*Pt.* 1)] 326-.
- , direct reading, aperiodic. *Curie, P.* C. R. 108 (1889) 663-; *Par. S. Ps. Sé.* (1889) 218-.
- , —, —, *Curie's.* *Ledeboer, P. H.* *Lum. Élect.* 36 (1890) 161-.
- , new arrestment. *Lannoy, S. de.* Z. Instk. 17 (1897) 261-.
- , — construction. *Kruspér, I.* [1886] *Mth. Term. Ét.* 5 (1887) 70-; *Mth. Nt. B. Ung.* 5 (1886-87) 1-.
- , optical apparatus for rapid weighing. *Collot, A.* C. R. 112 (1891) 99-.
- , reading arrangement. *Spoerhase, W.* Z. Instk. 16 (1896) 167-.
- recent construction, description. *Bunge, P.* *Carl Rpm.* 16 (1880) 372-.
- reflection-. *Wartmann, É.* [1841] *Gen. Mm.* S. Ps. 11 (1846) 115-.
- *Grassi, G.* N. Cim. 11 (1874) 195-, 217-.
- registering. *Sprung, A.* *Berl. Ps. Gs. Vh.* (1887) 13 (*bis*)-; Z. Instk. 8 (1888) 17-.
- Roman (or steel-yard). *Ferroni, P.* *Mod. S. It. Mm.* 17 (1815) 417-.
- (— — —), ancient. *Commaille, A.* J. Phm. 44 (1863) 490-.
- (— — —), improvements by Paul. *Pictet, M. A.* J. Mines 8 (1797-98) 671-.
- (— — —), micrometric. *Bourcart, R.* [1888] *Mulhouse S. In. Bll.* 59 (1889) 31-.
- (— — —), modification. *Hassenfratz, J. H.* J. Mines 8 (1798) 683-.

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- Roman (or steel-yard), new, report to Bureau Consultatif des Poids et Mesures. *Gathey*, —. *J. Mines* 8 (1797-98) 691-.
- (— —) and ordinary, levers used in construction and verification. *Desnaut*, —. *Auvergne A. Sc.* 26 (1853) 273-.
- (— —), theory. *Pickel*, *I.* *Münch. D.* (1814-15) 83-.
- scientific, construction and use. *Schwirkus*, *G.* *Z. Instk.* 7 (1887) 41-, 83-, 412-.
- sensitive and convenient, serving also as magnetometer. *Lampadius*, *W. A.* *Schweigger J.* 10 (1814) 171-.
- simple. *Black*, *Jos.* [1790] *Thomson A. Ph.* 10 (1825) 52-.
- substitution-. *Lohnstein*, *T.* *C. Ztg.* 20 (1896) 572-.
- sources of error. *Hennig*, *R.* *Z. Instk.* 5 (1885) 161-.
- spiral. *Cross*, *C. F.* *C. N.* 44 (1881) 101-.
- support. *Prony*, *R. de.* *A. C.* 36 (1800) 50-.
- tangential, direct reading of densities by. *Zenger*, *C. W.* [1871] *Prag Ab.* 5 (1872) 51 pp.
- temperature change in sensitiveness. *Middel*, *T.* *A. Ps.* 2 (1900) 115-.
- theory. *Rheinauer*, *J. A.* *Ps. C.* 133 (1868) 179-.
- (Rheinauer). *Müller*, *J. A.* *Ps. C.* 133 (\*1868) 682-.
- (Müller). *Rheinauer*, *J. A.* *Ps. C.* 135 (1868) 335-.
- *Sludskit*, *T. A.* (xii) *Rec. Mth.* (Moscou) 4 (1869-70) (Pt. 2) 111-.
- *Aldis*, *W. S.* [1876] *Newcastle C. S. T.* 3 (1877) 151-, 161-.
- *Moors*, *B. P.* *N. Arch. Wisk.* 12 (1886) 216-.
- and use. *Schönemann*, *T.* *Grunert Arch.* 24 (1855) 264-.
- vacuum, Bunge's. *Marek*, *W.* *Par. Poids et Mes. PV.* (\*1881) 45-.
- , new. *Kruspér*, *S.* *Z. Instk.* 9 (1889) 81-.
- verification and correction. *L'Homme*, — *de.* *Le Puy S. Ag. A.* (1828) 174-.
- vibrationless support. *Marek*, *W.* *Z. Instk.* 9 (1889) 175-.
- and weighing. *Zech*, *P.* *Carl Rpm.* 5 (1869) 102-.
- , theory. *Thiesen*, *M. F.* (xii) *Z. Instk.* 2 (1882) 358-; 3 (1883) 81-.
- and weights. *Schwirkus*, *G.* (xii) *Z. Instk.* 1 (1881) 84-, 124; 2 (1882) 310-.
- and weights, etc. *Stas*, —. *Par. Poids et Mes. PV.* (\*1875-76) 87-.
- Balances and weights, report on those used by the Commission. *Chisholm*, *H. W. A.* *Cons. Arts et Mét.* 10 (\*1873) 111-.
- Coins, machine for weighing. *Séguier*, *A. C.* *R.* 31 (1850) 188-.
- Gold bullion assay, new method of weighing for. *Foord*, *G.* [1875] *Vict. R. S. T.* 12 (1876) 93-.
- Grain, instrument for measuring. (Chondrometer.) *Ovenden*, —, & *Payne*, —. *Nicholson J.* 34 (1813) 198-.
- Scale, assorter's, and weighing machine, of Madras mint. *Smith*, *J. T.* *Madras Eng. Rp.* 2 (1846) 169-.

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- Scale-beam, construction. *Dearborn*, *B.* *Bost. Mm. Am. Ac.* 3 (1809) 40-.
- Steel-yard, Aristotle's. *Cappelle*, *J. P. van.* *Amst. Ts. Nt. Wet.* (1810-11) 305-.
- Weigh-bridge. *Rose*, *W. N.* *Amst. Ts. Ws. Nt. Wet.* 1 (1848) 172-.
- , Guillaumin's. *Pr. Dingler* 269 (1888) 496-.
- , new. *Steinheil*, *C. A. von.* *Wien SB.* (1850) (Ab. 2) 398-.
- , theory. *Endlweber*, *J.* *Exner Rpm.* 21 (1885) 637-.
- , — and construction. *Mohr*, *C. F.* *Dingler* 78 (1840) 195-.
- Weighing, approximate, apparatus. *Hase*, *R.* *Cztg. Opt.* 19 (1898) 191-.
- machine, compound (*bascule*), theory. *Moors*, *B. P.* *N. Arch. Wisk.* 3 (\*1877) 33-, 97-.
- , Quintenz. *E.... Crelle J.* 1 (1826) 157-.
- , — (or decimal). *Rühlmann*, —. *Dingler* 132 (1854) 255-.
- , —. *Rittershaus*, *T.* *Civing.* 21 (1875) 45-.
- , theory and description. *Schönemann*, *T.* *Wien D.* 8 (1854) (Ab. 2) 1-.
- machines. *Kent*, *W.* *Franklin I. J.* 126 (1888) 169-.
- , sensibility. *Schönemann*, *T.* [1852] *Wien D.* 5 (1853) 157-.
- , — (Schönemann). *Ettingshausen*, *A. von.* *Wien Sb.* 8 (1852) 442-.
- and recording machine, electrical. *McGarvey*, *E.* [1900] *Sc. Abs.* 4 (1901) 5.

## 0820 Measurement of Velocity, Acceleration, Energy of Visible Motion.

### MEASUREMENT OF VELOCITY.

- Aerostat, apparatus for. *Leloup*, *J.* *Aér.* (1896) 123-.
- Apparent motions of objects. *Van Dyck*, *F. C.* (xii) *Am. Mor. J.* 3 (1882) 72-.
- Cycles. *Guérin*, *V.* *Rv. Sc.* 42 (1888) 112-.
- Difficulties in calculation. *Denny*, *W.* *Glasg. I. Eng. T.* 18 (1875) 193-.
- Electric sparks, photography by, application. *Hermite*, *G.* *C. R.* 106 (1888) 561-.
- Engineering purposes, measurement for. [*Hele*] *Shaw*, *H. S.* *I. CE. P.* 69 (1882) 364-.
- Explosive waves, chronographic measurements of velocity. *Smith*, *F. J.* *R. S. P.* 45 (1889) 451-.
- Indicating and recording apparatus, theory. *Hele Shaw*, *H. S.* [1884] *Bristol Nt. S. P.* 4 (1885) 130-.
- Indicator of velocity and distance, by resistance of air. (Velodometer.) *La Valette*, *H. de.* *Gén. Civ.* 27 (1895) 11-.
- Intermittent light, use in measuring rapid motions. *Hermite*, *G. C. R.* 103 (1886) 412-.
- Kinometer. *Jacquemier*, *R.* *Rv. Mar. et Col.* 58 (1878) 265-; 94 (1887) 351-.

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- Pendulum, application. *Bouheporn*, —. C. R. 36 (1853) 831-.
- movements, velocity recorder in. *Lecarme, J., & Lecarme, L.* C. R. 124 (1897) 356.
- Photographic analysis of movements. *Marey*, —. J. de Ps. 3 (1884) 199-.
- methods. *Heun, K.* Z. Mth. Ps. 44 (1899) 18-.
- Pumping-engine velocity diagrams. *Baird, D.* Fed. I. Mn. E. T. 9 (1895) 138-.
- Rapid movements, especially periodic, observation. *Plateau, J. A. F.* Brux. Ac. Bll. 6 (1863) 484-.
- Recorder, new, and application to anemometry. *Griffiths, J. A.* N. S. W. R. S. J. 28 (1894) 281-.

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- Dolbear, A. E.* Am. J. Sc. 3 (1872) 248-.
- Schuller, A.* A. Ps. C. 146 (1872) 497-.
- Clarke, G. S., & McLeod, H.* R. S. P. 26 (1878) 157-.
- Jones, J. V.* Card. Nt. S. T. 20 (1889) 30.
- by centrifugal speed gauge. *Prytz, K.* Z. Instk. 11 (1891) 389-.
- counter, differential, mechanism and use. *Valesie, —.* C. R. 86 (1878) 1116-.
- , —, Valesie's (report). *Dupuy de Lôme, —.* C. R. 86 (1878) 1364-.
- , —, —. *Jourden, L.* [1881] Rv. Mar. et Col. 74 (1882) 55-.
- , for motors. *Gérard, A.* Brux. Ac. Bll. 47 (1879) 47-.
- of disks, etc. *Werner, —.* Berl. Pol. Gs. Vh. 23 (1861) 127-.
- indicator. *Bernardi, E.* Ven. I. At. 6 (1880) 778-.
- *Lambinet, —.* Rv. Mar. et Col. 81 (1884) 379-.
- *Samson, (le lt.) G.* Rv. Mar. et Col. 116 (1893) 39-.
- *Amaler, A.* Arch. Sc. Ps. Nt. 32 (1894) 291-.
- *Tétot, V.* Rv. Mar. et Col. 128 (1896) 434-.
- , electric. *Anon.* Tel. J. 15 (1884) 469.
- , —. *Dary, G.* Sc. Abs. 1 (1898) 673.
- , —. *Browne, W. H. (jun.)* Sc. Abs. 2 (1899) 432.
- , electromagnetic. *Claude, G.* Sc. Abs. 1 (1898) 97-.
- , magnetic. *Deprez, M.* Lum. Élect. 3 (\*1881) 407-.
- , pneumatic. *Rung, (Capt.) G.* Z. Instk. 6 (1886) 201-.
- for ships' screw propellers. *Campbell, (Sir) A., & Goolden, W. T.* L. Ps. S. P. 6 (1885) 147-; Ph. Mg. 18 (1884) 57-.
- — —. *Drouet, (le lt.) G.* Rv. Mar. et Col. 118 (1893) 458-.
- indicators. *Richard, G.* Lum. Élect. 15 (1885) 258-, 295-; 34 (1889) 101-.
- , new. *Richard, —.* Cg. Int. Chron. (1889) 205-.
- means of producing constant. *Webster, A. G.* Am. J. Sc. 3 (1897) 379-.
- periods. *Prytz, K.* [1890] Kjsb. Dn. Vd. Selsk. Skr. 7 (1890-94) 35-.

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- spiral goniometry in relation to. *Barus, C.* Am. J. Sc. 48 (1894) 1-.
- stroboscopic measurements. *Ettingshausen, A. von.* Carl Rpm. 12 (1876) 1-.
- tachometer. *Donkin, B.* Tilloch Ph. Mg. 38 (1811) 42-.
- *Thomas, A.* As. Fr. C. R. (1874) 154-.
- *Sartiaux, E.* Lum. Élect. 13 (1884) 340-.
- *Käl, A.* Oestr. Z. Brgw. 41 (1893) 471-.
- (Vedovelli's). *Thuillier, G.* Par. S. Ps. Sé. (1899) 50\*.
- , differential. *Fuchs, K.* Elekttech. Z. 9 (1888) 300-.
- , electric. *Picou, R. V.* Lum. Élect. 29 (1888) 416-.
- , — hand. *Fessenden, R. A.* Sc. Abs. 3 (1900) 170-.
- , registering. *Anon.* Elekttech. Z. 7 (1886) 126-.
- testing and study. *Göpel, F.* Z. Instk. 16 (1896) 33-.
- and torsion, telephonic indicator. *Resio, C.* C. R. 94 (1882) 854-; Lum. Élect. 6 (\*1882) 399-.
- variable, new system for imparting and recording. *Beaumont, M. W.* Elect. 17 (1886) 364-.
- variations, in motors. *Leauté, H.* Gén. Civ. 12 (1887-88) 163.
- , —. *Bourcart, R.* Mulhouse S. In. Bll. 63 (1893) 418-.
- , small. *Anthony, W. A.* Am. As. P. (1886) 118-.
- Running, instrument recording velocity. *Marey, E. J.* C. R. 104 (1887) 1582-.
- Seismic movement, velocity, and acceleration of wave-particle, determination, Indian observations, 1897, and formulæ. *Oldham, R. D.* I. Gl. Sv. Mm. 29 (1899) 344-.

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- Hamill, H.* Nicholson J. 14 (1806) 348-.
- Mayette, J.* Mâcon Ac. A. 6 (1888) 341-.
- currents, etc., instrument for. *Napier, J. R.* Glasg. Ph. S. P. 3 (1848-53) 350-.
- indicator. *Russell, J. S.* B. A. Rp. (1842) (pt. 2) 109.
- instrument for. *Hopkinson, F.* [1783-90] Am. Ph. S. T. 2 (1786) 159-; 3 (1793) 239-.
- *Cooke, J.* Nicholson J. 5 (1802) 43-, 265-.
- *Burney, J.* Nicholson J. 24 (1809) 57-.
- , and governor of engines. *Lambinet, E.* Rv. Mar. et Col. 95 (1887) 177-.
- , by log-line. *Newman, J.* QJ. Sc. 2 (1817) 90-.
- instruments for. *Brit. Ass. Comm.* B. A. Rp. (1879) 210-.
- *Gelcich, E.* Z. Instk. 4 (1884) 231-, 274.
- *Pressure-log experiments.* *Froude, W.* B. A. Rp. (1874) 255-.
- log. *Gould, C.* Gilbert A. 8 (1801) 474-.

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- log. *Gelcich, E. Z. Instk. 5 (1885) 394-*.  
*Baule, (le lt.) A. Rv. Mar. et Col. 112 (1892) 374-; 120 (1894) 116-*.  
 — and anemometer and warning compass. *Fleuriais, G. Rv. Mar. et Col. 71 (1881) 433-*.  
 —, correction of errors. *Keller, F. A. E. (vi Add.) A. Hydrog. 14 (1858) 887-*.  
 —, electric. *Hubbard, S. Science 8 (1886) 256-*.  
 —, —. *Fleuriais, G. Rv. Mar. et Col. 100 (1889) 329-*.  
 —, —. *Le Goarant de Tromelin, (le lt.) G. Rv. Mar. et Col. 110 (1891) 302-*.  
 —, —, automatic. *Ricart Giralt, J. [1893] Barcel. Ac. Bl. 1 (1892-1900) 122-*.  
 —, —, on principle of Robinson cup anemometer. *Fleuriais, G. Rv. Mar. et Col. 63 (1879) 465-; C. B. 96 (1883) 1633-*.  
 —, —, —, —, —. *Le Goarant de Tromelin, G. C. R. 96 (1883) 1441-*.  
 —, —, —, —, —. *Soulages, C. C. Lum. Élect. 14 (1884) 165-, 260-*.  
 —, hydrostatic. *Berthon, E. L. R. S. P. 5 (1850) 919*.  
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—, electric. *Kuzminskij, P. D.* Rs. Ps.-C. S. J. 28 (Ps.) (1896) 226-.

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—, —. *Meylan, E.* Lum. Élect. 27 (1888) 424-.

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- — — large earth waves. *Cancani, A.* Rm. R. Ac. Linc. Rd. 3 (1894) (Sem. 1) 551-.
- of the Vatican Observatory. *Bertelli, T.* Rm. N. Linc. At. 49 (1896) 135-; Rm. Spec. Vat. Pb. 5 (1898) 151-.
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- in seismology. *Mocenigo, (conte) G., & Rossi, M. S. de.* (xii) Bll. V. It. 5 (1878) 53-.
- — —. *Cancani, A.* Rm. R. Ac. Linc. Rd. 3 (1894) (Sem. 1) 328-.
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- Bertelli, T.* Rm. Bll. Met. 11 (1872) 113-.
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- Instrument, new. *Mugna, G.* (xii) Rv. Sc.-Ind. 11 (1879) 205-, 313-.
- Microseismograph. *Rossi, M. S. de.* Rm. N. Linc. At. 29 (1876) 420.
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- (vertical component). *Vicentini, G., & Pacher, G.* Ven. I. At. (1898) 65-.
- of 2 components. *Landi, U.* Rv. Sc. [Ind.] 30 (1898) 92-.
- — —, and other self-registering instruments. *Vicentini, G., & Pacher, G.* Ven. I. At. (1895-96) 385-.
- — —, for study of slow earth-movements. *Gnesotto, T.* Ven. I. At. (1898) 289-.
- , continuous registering. *Vicentini, G.* [1895] Padova S. Sc. Bll. 6 (1895-99) 21-.
- , use. *Vicentini, G.* Padova Ac. At. e Mm. 12 (1896) 89-.
- Microseismographs, Padua University. *Pacher, G.* Ven. I. At. (1896-97) 1110-.
- Microseismometrograph. *Agamennone, G.* Rm. R. Ac. Linc. Rd. 9 (1900) (Sem. 2) 81-.
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- Pendulums, effect of wind. *Melzi, C.* Rm. N. Linc. At. 28 (1875) 356-.
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- Tromometer. *Bertelli, T. M.* [1888-93] Rm. N. Linc. At. 42 (1889) 37-; Moncalieri Oss. Bll. 13 (1893) 2-.
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- — —. *Bertelli, T.* [1888] Bll. V. It. 15-16 (1888-89) 65-.
- Tromometers, new observations confirming utility. *Melzi, C.* Rm. N. Linc. At. 47 (1894) 96-.
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- , —. *Turner, H. H.* B. A. Rp. (1896) 216-.
- , — (Strassburg, 1895). *Ehlert, R.* Btr. Geops. 3 (1898) 131-.
- , — (Trieste, Aug. 1898—Feb. 1899). *Mazelle, E.* Wien Ak. Sb. 108 (1899) (Ab. 1) 357-.
- , — (San Fernando, 1898-99). *San Fernando Obs.* S. Fernando Obs. Mar. A. (Secc. 2) (1899) 2 pp.
- , — (Strassburg, 1895-96). *Ehlert, R.* Btr. Geops. 4 (1900) 68-.
- , — (Nicolaiev, 1897-99). *Kortazzi, J.* Btr. Geops. 4 (1900) 383-.
- , —. *Leutz, H.* Karlsruhe Nt. Vr. Vh. 13 (1900) (Ab.) 388-.
- (Zöllner's), photographic registration of changes of horizontal plane by. *Rebeur-Paschwitz, E. von.* As. Nr. 118 (1888) 9-.
- , suspension. *Ewing, J. A.* [1882] (xii) Jap. Seism. S. T. 5 (1883) 91-.
- , theory. *Hecker, O.* Btr. Geops. 4 (1900) 59-.
- triple, von Rebeur's. *Ehlert, R.* Btr. Geops. 3 (1898) 481-; *Bruce, S. Blg. As. Bl.* 3 (1898) 209-; 4 (1899) 11-.
- , von Rebeur-Ehlert's. *Bosch, F. J.* Cztg. Opt. 20 (1899) 141-.
- , use. *Agamennone, G.* Rm. R. Ac. Linc. Rd. 9 (1900) (Sem. 1) 107-.
- method of compensating, to make astatic. *Gray, T.* (xii) Jap. Seism. S. T. 3 (1881) 145-.
- new. *Agamennone, G.* Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 2) 308-.
- protographic. *Bertelli, T.* Moncalieri Oss. Bl. 16 (1896) 69-.
- Registration of distant earth movements. *Rebeur-Paschwitz, E. von.* Peterm. Mt. 39 (1898) 201-.
- , double, system. *Agamennone, G.* Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 1) 202-, 618.
- , duration. *Oddone, E.* Rm. R. Ac. Linc. Rd. 4 (1895) (Sem. 1) 425-.
- Rheotome, new electric, for seismic indicators. *Baratta, M.* Moncalieri Oss. Bl. 10 (1890) 161-.
- Rods, vibrating and oscillating. *Egidi, G.* Rm. N. Linc. Mm. 2 (1887) 33-; 3 (1888) 173-.
- Seismodynamograph. *Galli, I.* Rm. N. Linc. At. 38 (1885) 128-; Rm. N. Linc. Mm. 2 (1887) 221-.

*Seismographs.*

- Rossi, M. S. de.* (xii) Bl. V. It. 1 (1874) 141-; 2 (1875) 57-; 4 (1877) 5-; 5 (1878) 16, 99-; 10 (1883) 138-; (xi) Rm. N. Linc. At. 30 (1877) 326-.
- Galli, I.* (xii) Bl. V. It. 6 (1879) 125-.
- Gray, T.* Ph. Mg. 12 (1881) 199-.
- Stevenson, C. A.* [1882] Sc. S. Arts T. 10 (1883) 546-.
- West, C. D.* (xii) Jap. Seism. S. T. 6 (1883) 22-.
- Kleemann, R.* Z. Instk. 4 (1884) 113-.
- Bull, F.* [1885] N. Z. I. T. 18 (1886) 69-.
- Egidi, G.* Rm. N. Linc. At. 40 (1887) 56-.
- Flamache, A.* Brux. S. Blg. Gl. Bl. 4 (1890) (PV.) 37-.
- Fränkel, —.* Civing. 36 (1890) 379-.
- analysing, *Cecchi's.* *Giovannozzi, G.* Rm. N. Linc. Mm. 3 (1888) 165-.
- , —. *Marcillac, P.* Lum. Élect. 27 (1888) 572-.
- Angot, improvement, and shocks at Grenoble. *Kilian, W.* Isère S. Bl. 28 (1895) 129-.
- astatic horizontal lever. *Ewing, J. A.* R. S. P. 31 (1881) 440-.
- ball and cup. *Alexander, T.* (xii) Jap. Seism. S. T. 6 (1883) 30-.
- bracket machine, record. *Alexander, T.* (xii) Jap. Seism. S. T. 6 (1883) 13-.
- Cecchi* (Manilla Observatory). *Faura, F.* Jap. Seism. S. T. 8 (1885) 90-.
- , *Roberto, G.* Moncalieri Oss. Bl. 7 (1887) 181-.
- of 3 components, *Ewing's*, and duplex-pendulum. *Perrine, C. D.* As. S. Pac. Pb. 10 (1898) 72-.
- compound, description. *Carew, W. A.* [1893] N. Z. I. T. 26 (1894) 461-.
- with conical pendulum. *Grablovitz, G.* Rm. R. Ac. Linc. Rd. 7 (1891) (Sem. 1) 264-.
- Cordenons's* new. *Cordenons, F.* Bl. V. It. 12 (1885) 84-, 86-.
- cumulative. *Gregorio, A. de.* Palermo Ac. At. 3 (1895) (Sc. Nt.) 95-.
- electrical. *Cecchi, F.* [1875-76] Moncalieri Oss. Bl. 10 (\*1876) 129-; Rm. N. Linc. At. 29 (1876) 421-.
- , *Fröhlich, C.* Exner Rpm. 24 (1888) 79-.
- , *Fröhlich's.* *Sack, J.* Elekttech. Z. 8 (1887) 502-.
- electromagnetic. *Palmieri, L.* Smiths. Rp. (1870) 425-.
- Gray-Milne.* *Gray, T.* Glasg. Ph. S. P. 14 (1883) 221-; Gl. S. QJ. 39 (1883) 218-.
- , instructions for setting up. *Gray, T.* Jap. Seism. S. T. 12 (1888) 49-.
- , and other instruments in seismological laboratory of Imperial College of Engineering, Tokyo. *Milne, J.* [1887] Jap. Seism. S. T. 12 (1888) 33-.
- history. *Gelcich, E.* Z. Instk. 7 (1887) 422-.
- horizontal. *Fränkel, W.* Civing. 40 (1894) 223-.
- and vertical. *Fränkel, W.* Civing. 40 (1894) 677-.

## 0825 Seismographs

- improved. *Gray, T. Ph. Mg.* 23 (1887) 353-.
- , *Cowper, E. A. B. A. Rp.* (1888) 818-.
- , *Gray, T. Glasg. Ph. S. P.* 19 (1888) 330-.
- for large motions. *Gray, T. (xii) Jap. Seism. S. T. 3* (1881) 143-.
- Marvin. *Marvin, C. F. U. S. Mly. Weath. Rv.* 23 (1895) 250-.
- in Mauritius, Royal Alfred Observatory, six months' work. *Claxton, T. F. Obs.* 22 (1899) 263-, 330-.
- Milne's. *Moffett, C. Méx. Obs. Bl.* (1889) 66-.
- , records by. *Abbe, C. U. S. Mly. Weath. Rv.* 27 (1899) 214-.
- modern, results obtained. *Cancani, A. Rm. R. Ac. Linc. Rd.* 9 (1900) (*Sem.* 2) 94-.
- for observatories. *Ewing, J. A. Nt.* 34 (1886) 343-.
- at Observatory of Carson City. *Friend, C. W. U. S. Mly. Weath. Rv.* 28 (1900) 245.
- — Mineo. *Guzzanti, C. Moncalieri Oss. Bll.* 14 (1894) 117-.
- pendulum-. *Lang, H. O. D. Gl. Gs. Z.* 31 (1879) 775-.
- (new form). *Ewing, J. A. (xii) Jap. Seism. S. T. 1* (1880) (*Pt.* 1) 38-.
- , inventor. *Terrenzi, G. Rv. Sc.-Ind.* 19 (1887) 52-.
- portable. *Palmieri, L.* [1874] (*xii*) *Nap. Ac. Pont. At.* 12 (1878) 123-.
- recording vertical motion, diagrams. *Omori, F.* [1891] *Jap. Seism. S. T. 16* (1892) 53-.
- rectangular. *Gruey, L. J. Bll. As.* 8 (1891) 10-, 72.
- register, double velocity. *Agamennone, G. Rm. R. Ac. Linc. Rd.* 5 (1889) (*Sem.* 1) 788-.
- , ——. *Baratta, M. Moncalieri Oss. Bll.* 11 (1891) 73-.
- , ——. *Agamennone, G. Rm. R. Ac. Linc. Rd.* 1 (1892) (*Sem.* 2) 247-.
- , —, action (Marches, Sept. 21st, 1897). *Tacchini, P. Rm. R. Ac. Linc. Rd.* 6 (1897) (*Sem.* 2) 243-.
- , electric photographic. *Pfaundler, L. Wien Ak. Sb.* 106 (1897) (*Ab. 2a*) 551-.
- to register horizontal oscillations of earth in earth movements. *Thévenet, —. As. Fr. C. R.* (1896) (*Pt.* 2) 238-.
- vertical motion. *Gray, T. (xii) Jap. Seism. S. T. 3* (1881) 137-; (*x*) *Ph. Mg.* 12 (1881) 209-.
- self-recording, Bréguet's. *Abbadia, M. A. d'. Bll. V. It.* 14 (1887) 38-.
- , of Geneva Observatory. *Thury, M. Arch. Sc. Ps. Nt.* 16 (1886) 195-.
- and theory of earthquakes. *Pilgrim, L.* [1895] *Würtb. Jh.* 52 (1896) xli-.
- with vertical pendulum. *Viola, C. Rm. R. Ac. Lind. Rd.* 9 (1900) (*Sem.* 1) 317-.
- Seismological notes. *Werner, W. Z. Instk.* 5 (1885) 217-, 308-.

## Seismometers 0825

## Seismometers.

- Portlock, J. E. B. A. Rp.* (1854) 370-.
- Kreil, C. Wien Sb.* 15 (1855) 370-.
- Cavalleri, G. M. Mil. At. I. Lomb.* 1 (1858) 84-.
- Mallet, R. B. A. Rp.* (1858) 72-.
- Bertelli, T.* [1871] (*xii*) *Rv. Sc.-Ind.* 3 (1872) 86-.
- Lasaulz, A. C. P. F. von. Bonn Niedr. Gs. Sb.* (1874) 99-.
- Wagener, G.* [1878] (*xii*) *D. Gs. Ostay. Mt.* 2 (1878-80) 216-.
- Wichmann, A. Z. Instk.* 4 (1884) 202-.
- Dijk, P. van. Batav. Ntk. Ts.* 45 (1886) 415-.
- Ehlert, R. Btr. Geops.* 3 (1898) 350-.
- Palatin, G. Termt. Közl.* 31 (1899) (*Suppl.*) 143-.
- astatic suspension, certain methods. *Ewing, J. A. (xii) Jap. Seism. S. T. 6* (1883) 25-.
- duplex pendulum. *Ewing, J. A.* [1882] (*xii*) *Jap. Seism. S. T. 5* (1883) 89-.
- (Ewing's). *Sekiya, K.* [1884] *Jap. Seism. S. T. 8* (1885) 83-.
- —. *Ewing, J. A. Nt.* 38 (1888) 30.
- electrical. *Kern, O. Lum. Élect.* 13 (1884) 132-.
- Hipp chronometer as. *Hirsch, A. Neuch. S. Sc. Bll.* 20 (1892) 176.
- for the mantel-piece. *Milne, J.* [1891] *Jap. Seism. S. T. 16* (1892) 47-.
- mercury. *Lasaulz, — von. Bonn Niedr. Gs. Sb.* (1884) 96-.
- , *Lepsius, R. D. Gl. Gs. Z.* 36 (1884) 29-.
- , *Kalecsinsky, S.* [1891] *Föl. Közl.* 22 (1892) 377-, 415-.
- observations. *Schmidt, A. Würtb. Jh.* 48 (1892) xciii-.
- Pagani's (1836). *Bertelli, T. Bll. V. It.* 15-16 (1888-89) 80.
- pendulum-, modern forms. *Milne, J.* [1887-88] *Jap. Seism. S. T. 12* (1888) 21-; *Nt.* 37 (1888) 570-.
- photograms, Liverpool Observatory. *Plummer, W. E. B. A. Rp.* (1898) 272-.
- and torsion pendulum seismograph. *Gray, T. (xii) Jap. Seism. S. T. 1* (1880) (*Pt.* 1) 44-.
- for vertical motion. *Ewing, J. A. (xii) Jap. Seism. S. T. 3* (1881) 140-.
- Seismometrograph. *Bertelli, T. Moncalieri Oss. Bll.* 6 (\*1871) 99-.
- of Catania Observatory. *Ricciò, A.* [1896] *Catania Ac. Gioen. At.* 10 (1897) *Mem.* 5, 15 pp.
- , continuous registering. *Cancani, A. Rm. R. Ac. Linc. Rd.* 8 (1899) (*Sem.* 1) 46-, 447-.
- , photographic. *Agamennone, G. Rm. R. Ac. Linc. Rd.* 6 (1897) (*Sem.* 1) 254-.
- Seismometrographs, astaticity of stationary masses or neutral point. *Grablovitz, G. Rm. R. Ac. Linc. Rd.* 7 (1891) (*Sem.* 1) 337-.
- , possible sensitiveness. *Tacchini, P. Rm. R. Ac. Linc. Rd.* 7 (1891) (*Sem.* 1) 15-.
- Seismometry. *Ewing, J. A. (xii) Tök. Un. Mm.* 9 (1883) *xii* + 92 pp.

0825 *Seismoscopes*

- Seismometry (methods and results). *Ewing*, *J. A.* Nt. 30 (1884) 149-, 174-.
- , *Johnston-Lavis*, *H. J.* Nt. 30 (1884) 608-.
- , *Ewing*, *J. A.* [1884] Nt. 31 (1885) 4-.
- , *Johnston-Lavis*, *H. J.* [1884] Nt. 31 (1885) 53-.
- , (Movements of the ground, and proposed observations on Ben Nevis.) *Ewing*, *J. A.* B. A. Rp. (1885) 920-.
- , *Ewing*, *J. A.* [1888] R. I. P. 12 (1889) 361-.
- as applied to railway trains. *Milne*, *J.* [1889] Jap. Seism. S. T. 15 (1890) 23-.
- , 5 mile water level in. *Mayet*, *P.* Seism. J. Jap. 18 (1893) 115-.
- , neglected principle that may be employed in. *Perry*, *J.*, & *Ayrton*, *W. E.* Jap. As. S. T. 5 (1877) (Pt. 1) 181-.
- , steady points for. *Gray*, *T.* (xii) Jap. Seism. S. T. 3 (1881) 1-, 9-.
- Seismomicrophone with photographic registration. *Baratta*, *M.* Rv. Sc.-Ind. 22 (1890) 218-.

*Seismoscopes.*

- Mallet*, *R. B. A.* Rp. (1851) 272-.
- (*Spha sismica*.) *Mensini*, *J.* (xii) Rv. Sc.-Ind. 7 (1875) 117-.
- (— *ortosismica*, for vertical earthquakes.) *Mensini*, *J.* (xii) Rv. Sc.-Ind. 7 (1875) 166-.
- Bertelli*, *T.* Rm. N. Linc. At. 34 (1881) 67-.
- Anon.* Rv. Sc.-Ind. 21 (1889) 221-.
- Bovieri*, *F.* Rm. N. Linc. At. 46 (1893) 45-.
- Agamennone*, *G.* Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 1) 41-.
- biflar. *Egidi*, *G.* Bl. V. It. 14 (1887) 86-.
- Brassart apparatus with disc. *Brassart*, *E.* Bl. V. It. 12 (1885) 103-.
- electric. *Grablowitz*, *G.* Rv. Sc.-Ind. 25 (1893) 198-.
- , *Agamennone*, *G.* Rm. R. Ac. Linc. Rd. 9 (1900) (Sem. 1) 204-.
- improved form. *Herschel*, *A. S.* N. Eng. I. Mn. E. T. 37 (1888) 101-.
- magnetograph as. *Mendenhall*, *T. C.* Am. As. P. (1890) 89.
- mercury, *Cavalli* (1784). *Baratta*, *M.* [1896] Pisa S. Tosc. At. (PV.) 10 (1895-97) 191-.
- , contributions to history. *Baratta*, *M.* Pisa S. Tosc. At. (PV.) 10 (1895-97) 243-; 11 (1897-98) 84-.
- and seismological investigations. *Mendenhall*, *T. C.* Am. J. Sc. 35 (1888) 97-.
- Triflar gravimeter. *Schmidt*, *A.* Btr. Geops. 4 (1900) 109-.
- Tromoseismometer. *Bertelli*, *T.* Rm. N. Linc. At. 27 (1874) 194-.
- Vibrations, seismic, and seismometric indications. *Bertelli*, *T.* Rm. N. Linc. At. 42 (1889) 95-; Rm. N. Linc. Mn. 6 (1890) 67-.
- Spring balance. *Oeri*, —. Sch. Gs. Vh. (1841) 212-.
- for accurate weighing. *Jolly*, *P.* Münch. Sb. (1864) (1) 162-.

## Measurement of Force 0825

- Spring balance, improved, for Prony brakes. *Weittler*, *A.* Elekttech. Z. 19 (1898) 658-.
- , new. *Steinheil*, *C. A. von.* Münch. Gelehrte Az. 8 (1839) 817-.
- , — form. *Linebarger*, *C. E.* Ps. Rv. 11 (1900) 110-.
- Springs, use in apparatus for delicate measurements. *Witz*, —. Brux. S. Sc. A. 21 (1897) (Pt. 1) 19-.
- Steam-engine, measurement of useful force in, without brake. *Mahistre*, —. C. R. 46 (1858) 39-.
- Suspension, biflar, measurement by. *Stähelin*, *C.* Sch. Gs. N. D. 18 (1858) vi + 204 pp.
- , —, mechanical temperature compensation. *Litznar*, *J.* Z. Instk. 8 (1888) 13-, 76.
- , triflar, use in physical apparatus. *Thompson*, *S. P.* B. A. Rp. (1897) 588.
- , unifilar, value of torsional couple. *Limb*, *C.* C. R. 114 (1892) 1057-.
- Thermodynamometer, description and theory. *Berruti*, *G.* Tor. At. Ac. Sc. 7 (1871-72) 485-.
- Torsion balance, American. *Dittmar*, *W.* Z. Instk. 10 (1890) 433-.
- , Coulomb's. *Muncke*, *G. W.* Pogg. A. 17 (1829) 159-; 18 (1830) 239-; 29 (1833) 881-.
- , —, modification. *Gieselcr*, —. Bonn Niedr. Gs. Sb. (1891) 89.
- , counteracting change of level in. *Kent*, *W.* Am. As. P. (1886) 116.
- , effect of bodies at various temperatures near arm. *Lenz*, *E.* Pogg. A. 25 (1832) 241-.
- , mirror for use with. *Kent*, *W.* Am. As. P. (1886) 116-.
- , new. *Springer*, *A.* Am. I. Mn. E. T. 12 (1884) 569-.
- , — experiments. *Reich*, *F.* Leip. Ab. Mth. Ps. 1 (1852) 383-.
- , oscillations, theory. *Brandes*, *H. W.* Voigt Mg. 12 (1806) 300-.
- , resistance of air. *Baille*, *J. B.*, & *Cornu*, *A.* C. R. 86 (1878) 571-.
- , terms proportional to square of displacement in. *Baille*, *J. B.*, & *Cornu*, *A.* C. R. 86 (1878) 1001-.
- , unifilar. *Tammen*, *H. G.* Carl Rpm. 18 (1882) 348-.
- balances. *Springer*, *A.* B. A. Rp. (1887) 636.
- , and elasticity of glass threads. *Ritchie*, *W.* Phil. Trans. (1830) 215-.
- , ————. *Goode*, *W. H.* Franklin I. J. 24 (1839) 867-.
- of fine threads. *Bouasse*, *H.* A. C. 11 (1897) 433-.
- method of determining small weights. *Loewenherz*, *L.* (xii) Z. Instk. 1 (1881) 184-.
- Torsional moments, method of determining. *Negbaur*, *W.* A. Ps. C. 41 (1890) 631-.
- Trains, energy stored in, at different velocities. *Dudley*, *P. H.* Am. Eng. & Railroad J. 73 (1899) 366.
- , tractive force, resistance, and acceleration. *Mallock*, *A.* B. A. Rp. (1900) 877-.

## 0835 Fluid Pressure and Velocity

- Watt and the measurement of power. *Preece, W. H.* *Elect.* 38 (1897) 511-.
- Work done by men. *Field, Jos.* *CE. I. T.* 2 (1838) 211-.
- under various conditions. *Coulomb, C. A.* *Par. Mm. de l'I.* 2 (1799) 380-.
- of man using crank. *Hecht, D. F.* *N. Bergm. J.* 4 (1804) 185-.

## 0835 Measurement of Fluid Pressure and Fluid Velocity. (See also Mechanics 2830 and Meteorology 0310, 0312, 0314.)

- Action of powder in gun, theoretical determination. *Wrede, F. J.* *Stockh. Ak. Hndl.* 10 (1871) No. 1, 42 pp.
- Air meter, integrating. *Morin, A.* *C. R.* 54 (1862) 232-.
- for measuring draught for furnaces. *Kallstenius, G. S.* *Stockh. Ak. Hndl.* (1820) 260-; *Karsten Arch. Bergbau* 5 (1822) 345-.
- velocity of air in flues and chimneys. *Fletcher, A. E.* *B. A. Rp.* 37 (1867) (Sect.) 33-; 39 (1869) (Sect.) 48-; *Lpool. Lt. Ph. S. P.* 24 (1870) 31-.
- mines, etc. *Combes, C.* *A. Mines* 13 (1838) 103-.
- Barometer, mathematical theory of oscillations. *Liais, E.* *Cherb. Mm. S. Ac.* (1852) 97-.
- mercury, new forms. *Guglielmo, G.* *Rm. R. Ac. Linc. Rd.* 2 (1893) (Sem. 1) 474-.
- Compressibility of gases. *Akin, C. K.* *Ph. Mg.* 25 (1863) 289-.
- Compression of gases. *Despretz, C.* *A. C.* 34 (1827) 335-.
- liquids. *Despretz, C.* *C. R.* 21 (1845) 216-.
- Dubuat's paradox on solid in moving fluid and vice versa. *Žukovskij, N. E.* *Mosc. S. Sc. Bll.* 73 (No. 1) (1891) 21-; *Fschr. Ps.* (1891) (Ab. 1) 253-.
- Efflux of air, experiments. *Wilde, H.* *Manch. Lt. Ph. S. Mm.* 10 (1887) 182-.
- Elastic after-effect in spring barometer. *Reinhertz, C.* *Z. Instk.* 7 (1887) 153-, 189-.
- Expansive power of compressed air compared with that of powder gas. *Borkenstein, F.* *Mg. Ntvd.* 8 (1828) 121-.
- Flow of fluid down inclined plane. *Seddon, J. A.* [1888] *St. Louis Ac. T.* 5 (1892) xxvii-.
- gases. *Reynolds, O.* [1885] *Manch. Lt. Ph. S. Mm.* 10 (1887) 164-.
- constant. *Hugoniot, H.* *C. R.* 102 (1886) 1545-; *A. C.* 9 (1886) 375-.
- Gas governor, needle. *Peebles, D. B.* [1879] *Sc. S. Arts T.* 10 (1883) 303-.
- meter, wet. *Ullherr, J. C.* *Dingler* 165 (1862) 259-; 166 (1862) 112-.
- at constant level. *Moors, B. P.* *Delft Éc. Pol. A.* 4 (1888) 168-; 5 (1889) 139-.

## Manometers 0835

- Gas meters. *Elsner, R. W.* (vi *Adds.*) *Berl. Pol. Gs. Vh.* 17 (1856) 61-.
- apparatus for gauging. *Ruhmann, —.* *Dingler* 155 (1860) 337-.
- improved method of maintaining just water level. *Sanders, G.* *Dubl. R. S. J.* 1 (1856-57) 32-.
- improvements. *Abria, —.* *Bordeaux Act.* (1850) 509-.
- regulation of pressure. *Cavaillé-Coll, A.* *C. R.* 56 (1863) 339-.
- Gasometer with uniform pressure. *Steevens, J.* *Tilloch Ph. Mg.* 24 (1806) 163-; 27 (1807) 34-.
- Impact of water on plane surface, Weisbach's theory. *Smith, W. C., & Sheble, F.* *Franklin I. J.* 124 (1887) 257-.
- Instrument to measure force of blast in bellows, etc. *Banks, —.* [1800] *Manch. S. Mm.* 5 (1802) 398-.
- and experiments on flow of air from vessels. *Gilbert, L. W.* *Gilbert A.* 23 (1806) 286-.

## MANOMETERS.

(See also 1450.)

- Rettberg, E. F.* *Gilbert A.* 42 (1812) 99-.
- Russell, H.* *Tilloch Ph. Mg.* 68 (1824) 92-.
- Ziegler-Pellis, J.* *Act. S. Helv.* (1858) 128-.
- Silva-Pinto, M. V. da.* *Lisb. J. Sc. Mth.* 3 (1871) 239-.
- Yagn [Jagn], N.* [1876] (xii) *Mosc. S. Sc. Bll.* 39 [No. 2] (1880) 181-.
- Kraevich, K. D.* (xii) *Ra. C. Ps. S. J.* 9 (Ps.) (1877) [(Pt. 1)] 252-.
- Bristol, W. H.* *Am. As. P.* (1888) 89-.
- Villard, —.* *C. B.* 116 (1893) 1124-.
- balance. *Schreiber, K. A. P.* (xii) *Z. Instk.* 1 (1881) 257-, 288-, 333-.
- bell. *Rateau, —.* *As. Fr. C. B.* (1892) (Pt. 1) 160.
- for blast-engines. *Nordenskiöld, N.* [1837] *St. Pé. Ac. Sc. Bll.* 3 (1838) 265-.
- Bourdon. Samuelson, A.* *Civing.* 7 (1861) 455-.
- *Worthington, A. M.* *Nt.* 41 (1890) 296.
- *Greenhill, A. G.* *Nt.* 41 (1890) 517-.
- *Worthington, A. M.* *Nt.* 42 (1890) 125-.
- *Rayleigh, (Lord).* *Nt.* 42 (1890) 197.
- formulæ. *Résal, H.* *A. Mines* 11 (1867) 381-.
- Tait, and Amagat gauges, comparison. *Barus, C.* *Ph. Mg.* 31 (1891) 400-.
- compensation, for air pressure. *Prytz, K.* *Ts. Ps. C.* 24 (1885) 129-, 224; *Fschr. Ps.* (1885) (Ab. 1) 391-.
- compressed air. *Machado, V.* [1882] *Lisb. J. Sc. Mth.* 9 (1883) 110-.
- *Lussana, S.* *N. Cim.* 12 (1900) 237-.
- general formulæ, and for stereometer. *Volpicelli, P.* *Tortolini A.* 8 (1857) 169-.
- graduation. *Garnault, E.* (vii) *A. Gén. Civ.* 2 (1863) (pt. 2) 377-.
- construction and use. *Lenkes, C. R. L.* [1894] *Glasg. I. Eng. T.* 38 (1895) 15-.



- crusher-, law of resistance of cylinder. *Vieille*, P. C. R. 114 (1892) 1468-.
- , measurement of pressure by. *Kellner, W., & Deering, W. H.* R. S. P. 57 (1895) 404-.
- , — — — of explosives by. *Sarrau, —, & Vieille, —.* C. B. 102 (1886) 1054-.
- data for use with. *Amagat, E. H.* C. R. 99 (1884) 1017-, 1158-.
- differential. *König, A.* C. Ztg. 13 (1889) 1159; *Dingler* 275 (1890) 518-.
- (*König*). *Käß, A.* Oestr. Z. Brgw. 38 (1890) 308-.
- (—). *Brown, M. W.* [1892] N. Eng. I. Mn. E. T. 41 (1893) 160-; 42 (1893) 50.
- mercury. *Ravenek, H. A.* 's Gravenh. I. Ing. Ts. (1884-85) (Vh.) 1-.
- piston, for very high pressures. *Amagat, E. H.* C. R. 103 (1886) 429-.
- Edson self-recording. *Franklin Inst. Comm.* Franklin I. J. 137 (1894) 241-.
- electric. *Deprez, M.* Par. S. Ps. Sé. (1879) 20-.
- , for small variations of pressure. *Richard, G., & Richard, L.* C. R. 112 (1891) 1359-.
- Kundt's*. *Dvořák, V.* Wien Sb. 68 (1873) (Ab. 2) 7-.
- 2-liquid amplifying. *Grenier, W.* Laus. S. Vd. Bll. 13 (1874-75) 652-.
- differential. *Achard, A.* Arch. Sc. Ps. Nt. 49 (1874) 344-.
- McLeod gauge and air pumps. *Bertin, A. A.* C. 19 (1880) 231-.
- metallic, theory. *Marangoni, C.* (xii) Rv. Sc.-Ind. 12 (1880) 326-.
- micromanometer. *Smits, A.* Amst. Ak. Vs. 4 (1896) 145-, 198; 5 (1897) 292-; Arch. Néerl. 1 (1896) 97-.
- mirror. *Parragh, G.* Termt. Közl. 20 (1888) (Suppl.) 78-; Mth. Nt. B. Ung. 6 (1889) 408-.
- *Kont, G.* Mth. Termt. Éts. 12 (1894) 277-.
- new method of reading. *Marck, W. J. Carl* Rpm. 16 (1880) 585-.
- open (*Richard*). *Combes, C.* A. Mines 7 (1845) 481-.
- *Hemptinne, A. D. de.* Brux. Ac. Bll. 12 (1845) 541-.
- , on Eiffel Tower. *Cailletet, L.* C. R. 112 (1891) 764-.
- , — — —. *Nansouty, M. de.* Gén. Civ. 18 (1890-91) 385-.
- , for high pressures. *Cailletet, L.* C. R. 84 (1877) 82-.
- , — low pressures. *Marnier, A.* Dingler 255 (1885) 471-.
- for high pressures. *Seaward, S.* Tilloch Ph. Mg. 63 (1824) 36-.
- — —. *Cailletet, L.* C. R. 83 (1876) 1211-; Les Mondes 42 (1877) 50-, 239-, 450-.
- — —. *Marié, G.* I. ME. P. (1880) 455-.
- — —. *Tait, P. G.* Edinb. R. S. P. 10 (1880) 572-.
- — —. *Thiesen, M. F.* (xii) Z. Instk. 1 (1881) 114-.
- — —. *Nansouty, M. de.* Gén. Civ. 9 (1886) 19-.
- low pressures of gas. *McLeod, H.* L. Ps. S. P. 1 (1876) 30-; Ph. Mg. 48 (1874) 110-.
- Bateau's*, with magnified scale. *Hauer, J. von.* Oestr. Z. Brgw. 41 (1893) 5-.
- self-recording. *Giltay, J. W.* [1882] 's Gravenh. I. Ing. Ts. (1883) 95-.
- , for guns. *Vieille, P.* C. R. 112 (1891) 1052-.
- , for high pressures. *Minotti, N. G.* Ven. At. 5 (1846) 311-.
- , — — —. *Parenty, H.* C. B. 102 (1886) 811-; *Dingler* 264 (1887) 74-.
- sensitive. *Villard, —.* C. R. 116 (1893) 1187-.
- *Charpentier, P.* C. R. 120 (1895) 439-.
- of simple construction. *Guglielmo, G.* Rv. Sc.-Ind. 25 (1898) 175-.
- spring, apparatus for testing. *Giltay, J. W.* Z. Instk. 5 (1885) 395-.
- standard. *Kamerlingh Onnes, H.* Amst. Ak. Vs. 8 (1900) 45-; Amst. Ak. P. 2 (1900) 29-.
- , mercury meniscus, correction. *Schalkwijk, J. C.* [1900-01] Amst. Ak. Vs. 9 (1901) 462-, 512-; Amst. Ak. P. 3 (1901) 421-, 481-.
- open, of reduced height. *Kamerlingh Onnes, H.* [1896] Amst. Ak. Vs. 7 (1899) 176-; Amst. Ak. P. 1 (1899) 218-.
- telegraphic. *Armellini, T.* Rm. N. Linc. At. 28 (1875) 229-.
- uniformly sensitive. *Moutier, J.* Par. S. Phlm. Bll. 1 (1877) 171-.
- for highest vacua. *Sutherland, W.* Ph. Mg. 43 (1897) 83-.
- vapour-tension. *Perrier, L.* C. R. 91 (1880) 538-.
- water. *Forbes, J. D.* Edinb. N. Ph. J. 19 (1835) 36-.
- , and anemometer. *Silliman, J. M.* [1888] Am. I. Mn. E. T. 17 (1889) 68-.
- Wollaston's*. *Napier, J. R.* Glasg. T. I. Eng. 12 (1869) 119-.
- Manometry, influence of weight on. *Kapustin, T.* Rs. Ps.-C. S. J. 26 (Ps.) (1894) 307-; J. de Ps. 4 (1895) 585-.
- Manostat. *Smits, A.* [1897] Amst. Ak. Vs. 6 (1898) 321-; Z. Ps. C. 33 (1900) 39-.
- Measurement of air enclosed in barometer. *Schreiber, P.* Exner Rpm. 22 (1886) 162-.
- — — in mines. *Dickinson, J.* [1875] Manch. Gl. S. T. 14 (1878) 31-.
- — draught and analysis of gas, apparatus. *Kasalovský, J.* Oestr. Z. Brgw. 26 (1878) 407-.
- — — in chimneys. *Schwartz, L.* Erdm. J. Tech. C. 2 (1828) 345-.
- — very high vacua. *Rood, O. N.* Am. J. Sc. 22 (1881) 90-.
- — velocity by gauging tube. *Bazin, H.* A. Pon. Chauss. 14 (1887) 195-.
- — vis viva of fluid in pipe. *Masoni, U.* Nap. I. Inc. At. 11 (1898) No. 2, 4 pp.
- Motion of steam in tubes. *Auscher, —.* A. Mines 7 (1895) 325-.
- Pascal's principle, experimental demonstration. *Pisati, G.* N. Cim. 27 (\*1868) 351-.

Piezometers used in hydraulic investigations, experiments. *Mills, H. F.* [1878] *Am. Ac. P.* 14 (1879) 26-.

Pitot's tube. *Rateau*, —. *A. Mines* 13 (1898) 331-.

—, modifications. *Darcy, H.* *Dijon Mm. Ac.* 6 (1857) (pte. 2) 159-.

Pneumatic analogue of potentiometer. *Shaw, W. N. B. A. Rp.* (1898) 778-.

— Wheatstone's bridge. *Shaw, W. N. R. S. P.* 47 (1890) 462-.

— brakes. *Huberti, A.* *Rv. Un. Mines* 1 (1888) 1-.

—, quick working. *Kapteyn, A. P.* 's *Gravenh. I. Ing. Ts.* (1888-89) (*Vh.*) 103-, 122-.

Powder gases, movement in bore of gun. *Piobert*, —. *C. R.* 49 (1859) 757-, 829-, 909-, 953-.

## PRESSURE.

*Bevan, B.* *Ph. Mg.* 6 (1829) 284-.

*Moutier, J.* *Par. S. Phlm. Bll.* 11 (1874) 48-.

*Menabrugge, G. van der.* *Brux. S. Sc. A.* 18 (1894) (*Pt.* 1) 18-.

of air, application in water installations. *Herhold*, —. *Hann. Archt.-Vr. Z.* 31 (1885) 509-.

—, balance. *Perrigault*, —. *Les Mondes* 38 (1875) 355-.

in air-pipes. *Pagliani, S., & Morisani, E.* *Nap. I. Inc. At.* 5 (1892) *No.* 3, 24 pp.

changes, measurement apparatus. *Wolf, L. C. Z. Instk.* 4 (1884) 50-.

—, — by mirror method. *Röntgen, W. C. A. Ps. C.* 51 (1894) 414.

and density, relations, deduced from principle of energy. *Herran, A. As. Fr. C. R.* (1898) (*Pt.* 1) 138-.

difference between hydrostatic and hydraulic. *Wallentin, I. G. A. Ps. C.* 4 (1878) 294-.

von Driberg's views. *Kersting, R.* [1845] (*viii*) *Riga Cor.-Bl.* 1 (1846) 81-.

effective, in hydraulic presses, arrangement of levers for measurement. *Köpping, H.* *Carl Rpm.* 17 (1881) 662-.

exerted by flow of liquid. *Bernardi, E.* *Ven. I. At.* (1887-88) 1809-.

of explosives. *Vieille, P.* *As. Fr. C. R.* (1890) (*Pt.* 1) 53-.

— fluid jet on wedge. *Kotelnikov, A. P.* *Kazan S. Nt. (Ps.-Mth.)* P. 8 (1890) 4-; *Fachr. Ps.* (1889) (*Ab.* 1) 858-.

— fluids in motion. *Bonnycastle, C.* [1840] *Am. Ph. S. T.* 7 (1841) 113-.

—, —, instrument for measuring. *Caligny, A. de.* *Par. S. Phlm. PV.* (1840) 106-.

— gas, measurement under different conditions. *Prytz, K.* *Ts. Ps. C.* 30 (1891) 289-.

—, regulation. *Obach, E.* *Tel. E. J.* 14 (1885) 339-.

—, regulator. *Murrill, P.* *Mcr. S. J.* (1898) 480-.

—, regulators. *Peebles, D. B.* [1876] *So. S. Arts T.* 9 (1878) 351-.

of gas, theories, critical account. *Gosiewski, W.* *Par. T. Nauk Śc. Pam.* 5 (\*1874) *Art.* 2, 15 pp.

gaseous, small. *Brush, C. F.* *Ph. Mg.* 44 (1897) 415-.

high. *Cailletet, L.* *A. C.* 19 (1880) 386-.

— *Marié, G.* *A. Mines* 19 (1881) 104-.

— *Barus, C.* *Am. Ac. P.* 25 (1890) 93-.

— *Jacobus, D. S.* *Am. As. P.* (1893) 123-.

— *Lisell, E.* *Stockh. Öfv.* (1898) 697-.

— *Palmer, A. de F.* *Am. J. Sc.* 6 (1898) 451-.

—, apparatus for production. *Stratton, S. W.* *Ph. Mg.* 38 (1894) 160.

indicator for pneumatic brake. *Kapteyn, A. P.* [1886] 's *Gravenh. I. Ing. Ts.* (1888-87) (*Vh.*) 102-.

— Westinghouse brake. *Kapteyn, A. P.* *Rv. Un. Mines* 19 (1888) 86-.

internal. *Steinhauser, A.* *Carl Rpm.* 18 (1877) 265-.

—, in moving liquid. *Boussinesq, J.* *Liouv. J. Mth.* 9 (1883) 425-.

kinetic, in homogeneous and incompressible fluid. *Gosiewski, W.* *Krk. Ak. (Mt.-Prz.) Pam.* 17 (1890) 123-; *Cr. Ac. Sc. Bll.* (1889) *No.* 9, xix-.

lateral, apparatus for demonstrating. *Carl, P.* *Carl Rpm.* 11 (1875) 63-.

laws, apparatus for demonstrating. *Strehl, K.* *Cztg. Opt.* 18 (1897) 181-.

in light fluids. *Julius, V. A.* *Mbl. Nt.* (1887) 1-.

— — —. *Plaats, J. D. van der.* *Mbl. Nt.* (1888) 23-.

methods of measuring. *Rojas, F. de P.* (*xii*) *Barcel. Ac. Mm.* 1 (1878) 237-.

— — —. *Guglielmo, G.* *Rm. R. Ac. Linc. Bd.* 2 (1893) (*Sem.* 2) 8-.

on part of surface of fluid. *Schiller, N.* *Mosc. S. Sc. Bll.* 91 (*No.* 1) (1894) 31-.

— plate and wedge by KirohhoFF's method. *Réthy, M.* (*xii*) *Orv.-Term. Éts.* 4 (1879) (*Term. Szak*) 105-.

potential. *Lyapunov, A. M.* (*xii*) *Rs. Ps.-C. S. J.* 13 (*Ps.*) (1891) [(*Pt.* 1)] 351-.

problem. *Malfatti, G. F.* *Mod. S. It. Mm.* 12 (1905) 100-.

produced by change of velocity in water pipes. *Frizell, J. P.* *Am. S. CE. T.* 39 (1896) 1-.

— explosive gaseous mixtures. *Petavel, J. E.* *B. A. Rp.* (1900) 655-.

— powder gases, accelerograph of Deprez for measuring. *Sebert, H.* *Par. S. Ps. Sé.* (1879) 107-.

regulation in gasometers. *Nöggerath, E. J.* *Civing.* 2 (1856) 67-.

in running water. *Schönemann, T.* *Berl. Mb.* (1861) 1136-.

small. *Fitzgerald, G. F., & Joly, J.* [1888] *Dubl. S. Sc. P.* 6 (1888-90) 123-.

sounding apparatus for ships. *Anon.* *Rv. Sc.-Ind.* [24 (1892)] 220-.

statical and dynamical, of water. *Bainbridge, E. N.* *Eng. I. Mn. E. T.* 21 (1872) 49-.

of stream of air on flat plate. *Willis, (Prof.) R.* [1828] *Camb. Ph. S. T.* 3 (1830) 129-.

## 0835 Fluid Pressure

- of stream, infinite, on wedge-shaped wall. *Bobuilev, D. K.* (xii) *Rs. Ps.-C. S. J.* 13 (Ps.) (1881) [Pt. 1] 63-; (ix) *A. Ps. C. Beibl.* 6 (1882) 169-.
- at right angles to direction of current. *Ludwig, C., & Stefan, J.* *Wien SB.* 82 (1858) 25-.
- streams. *Cattaneo, G.* [1822] *Padova N. Sag.* 2 (1825) 224-.
- on surface of immersed body. *Razzaboni, C.* [1862] (xi) *Mod. Ac. Sc. Mm.* 5 (1863) 3-.
- , plane or curved. *Martynowski, A.* *Par. T. Nauk Sc. Pam.* 8 (\*1873) 215-; 4 (\*1874) *Art.* 1, 78 pp.
- , —, theory. *Steen, A.* [1872] *Kjöv. Skr.* 9 (1873) 539- (*Rés.* 558-).
- and temperature measurements, capillary corrections. *Pernet, J. Z. Instk.* 6 (1886) 377-.
- theory. *Cournot, A. A.* (vi *Adds.*) *Férussac Bll. Sc. Mth.* 9 (1828) 10-.
- *Moon, R.* *Ph. Mg.* 36 (1868) 27-, 116-.
- true theory as applied to elastic fluids. *Moon, R.* (viii) *Ph. Mg.* 26 (1863) 70-.
- variation in fluid in motion. *Lagerhjelm, P.* *Sk. Nf. F.* 8 (1842) 819-.
- on wall (passage in Fischer's Physics). *Volpicelli, P.* *G. Arcad.* 49 (1831) 103-.
- (— — —) (Volpicelli). *Oddi, G.* *G. Arcad.* 50 (1831) 62-.
- of water at different depths. *Borel, F.* *Neuch. Bll.* 7 (pt. 2) (1866) 155-.
- against foundations. *Brennecke, L. Z.* *Bauw.* 36 (1886) 101-, iv.
- on walls of pipes. *Turazza, D.* *Cuyper Rv. Un.* 29 (1871) 405-.

- Reaction of liquid jet. *Webb, J. B.* *Franklin I. J.* 124 (1887) 144-, 463-; 125 (1888) 31-.
- produced by efflux of fluids in vessels containing them. *Brunacci, V.* *Brugnatelli G.* 7 (1814) 89-; *Mil. Mm. I. Lomb. Ven.* 3 (1816-17) 257-.
- Resistance to air currents in mines. *Elwen, T. L.* [1889] *N. Eng. I. Mn. E. T.* 38 (1891) 205-.
- — — — —. *Murgue, D.* [1893-94] *Fed. I. Mn. E. T.* 6 (1894) 185-, 418-; 7 (1894) 211-.
- formula for river flow. *Seidon, J. A.* *St. Louis Ac. T.* 5 (1892) lvi.
- Rheometer, application to Drummond's light and to the analysis of gas-burners. *Lemoine, É.* *As. Fr. C. R.* 2 (1873) 153-.
- Rhyameter. *Fletcher, A. E.* *B. A. Rp.* 41 (1871) (*Sect.*) 234-.
- Safety valve, Dulac's, experiments. *Walckenaer, C.* *A. Mines* 16 (1869) 124-.
- valves. *Libert, J.* *Rv. Un. Mines* 20 (1892) 269-.
- Suction by blowing. *Schinz, E.* *Bern Mt.* (1859) 104-.
- phenomenon. *Caligny, A. de.* *Par. S. Phlm. PV.* (1843) 30-.
- Sympiezometers, Adie's, and Cummins's, observations with. *Swart, J.* *Tindal Vh. Zee-wezen* 8 (1843) 613-.

## Fluid Velocity 0835

- Theory of efflux of elastic fluids. *Hugoniot, —.* *Par. S. Ps. Sé.* (1887) 7-.
- Vacuum produced by air current. *Girouard, (Dr.) —.* *Les Mondes* 6 (1864) 518-.

## VELOCITY.

- Vautier, T.* *C. R.* 108 (1886) 872-.
- of air. *Serrell, E.* *Aër. S. Rp.* 17 (1882) 5-.
- currents, underground. *Fuchs, P. Z. Berg. H.-Salw.* 47 (1899) (*Ab.*) 227-; 48 (1900) (*Ab.*) 12-.
- , distribution over section of tube. *Rechnagei, G.* *D. Nf. Vh.* (1899) (*Th.* 2, *Hälfte* 1) 76-.
- in pipes. *Donkin, B.* *I. CE.* P. 111 (1893) 345-.
- rushing into vacuum. *Wilde, H.* *Manch. Lt. Ph. S. Mm.* 10 (1887) 146-.
- in spout. *Hanappe, S.* *Rv. Un. Mines* 40 (1897) 114-.
- currents, adaptation of Robinson's anemometer to measurement. *Razzaboni, C.* *Bologna Ac. Sc. Mm.* 8 (1887) 597-.
- of air or water carrying mineral grains in suspension. *Thoulet, J. C. H.* 97 (1883) 1513-; *A. Mines* 5 (1884) 507-.
- , Amsler's hydrometric apparatus. *Zdziarski, A.* *Am. Eng. & Railroad J.* 67 (1893) 239-.
- , and direction, instrument for measuring, Leupold's electric. *Weber, L.* *Elekttech. Z.* 7 (1886) 303-.
- , —, instruments for recording. *Jones, J. R.* *R. S. P.* 24 (1876) 321-.
- , —, observations at single point. *Estignard, X.* *Rv. Mar.* 38 (1873) 224-.
- , —, registering apparatus for. *Weber, L.* [1896] *Schl.-Holst. Nf. Vr. Schr.* 11 (1898) 61.
- , experiments. *Fossombroni, V.* *Siena At. Ac.* 9 (1808) 261-.
- , hydrometric pendulum for measuring. *Bonati, T.* *Mod. Mm. S. It.* 8 (1799) 485-.
- , —, —, —. *Venturoli, G.* [1809-14] *Mod. S. It. Mm.* 14 (1809) 158-; *Bologna Opusc. Sc.* 1 (1817) 81-.
- , —, —, —. *Gerstner, F. J. von.* [1819] *Böhm. Gs. Ab.* 6 (1820) 92 pp.
- , instrument for measuring. *Regnier, E.* *Nicholson J.* 29 (1811) 68-.
- , —, —, —. [*Barilli, G.*] *Filopanti, Q. B.* *N. A. Sc. Nt.* 5 (1841) 165-.
- , —, —, —. *Stearns, F. P.* *Am. S. CE.* T. 12 (1883) 301-.
- , —, —, —, —, —, —, —. *Bonati, T.* *Verona Mm. S. It.* 2 (1784) 676-; *Mod. Mm. S. It.* 8 (1799) 485-; *Mil. Mm. I. Lomb. Ven.* 3 (1816-17) 85-.
- , —, —, —, —, —, —, —. *Venturoli, G.* *Bologna Opusc. Sc.* 1 (1817) 141-.
- , —, —, —, —, —, —, —. *Poletti, G.* *Bologna Opusc. Sc.* 2 (1818) 394-.
- , —, —, —, —, —, —, —. electric. *Fuchs, K.* *Elekttech. Z.* 8 (1887) 74-, 150.
- , —, —, —, —, —, —, —. *Weber, L.* *Elekttech. Z.* 8 (1887) 149-.

## 0835 Fluid Velocity

- of currents, instrument for measuring, new. *Razzaboni, C.* Bologna Ac. Sc. Mm. 10 (1879) 185-.
- , —, —, recording. *Razzaboni, C.* Rm. At. R. Ac. 26 (1878) 512-.
- , —, —, testing. *Gordon, R.* I. ME. P. (1884) 190-.
- , —, —, Woltmann's. *Eytelwein, J. A.* Berl. Ab. (1816-17) 23-.
- , —, —, *Baumgarten, —.* Par. A. Pon. Chauss. 14 (1847) 326-.
- , —, —, *L'Éveillé, —.* Par. A. Pon. Chauss. 19 (1860) 215-.
- , —, —, *Treviranus, L. G.* Förster Al. Bauztg. 26 (1861) 125-.
- , —, —, *Culmann, K.* Zür. Vjschr. 13 (1868) 392-.
- , —, —, *Kvassay, E. von.* [1876] A. Pon. Chauss. 13 (1877) 236-.
- , —, —, *Rateau, —.* A. Mines 18 (1898) 331-.
- , —, —, formula of velocity. *Sasse, —.* Z. Bauw. 24 (1874) 77-; 26 (1876) 433-.
- , —, vertical parabola in measurements. *Sasse, —.* (xi) Hann. Archt.-Vr. Z. 19 (1873) 191-.
- measurement at sea. *Schück, A.* Z. Instk. 5 (1885) 385-.
- of ocean currents. *Fasci, A.* Rv. Mar. 27 (1869) 761-; 28 (1870) 162-.
- , —, —, at great depths. *Suchier, E.* Hann. Archt.-Vr. Z. 31 (1885) 373-.
- and pressure in current. *Michelotti, I.* [1805] Turin Mm. Ac. (1805-08) 181-.
- of rivers, and Harlacher's hydrometric apparatus and methods. *Ringel, A.* Civing. 31 (1885) 357-.
- , —, instrument for measuring, electric. *Harlacher, A. R.* [1883] Tel. E. J. 13 (\*1884) 148-.
- , —, new method of measuring. *Poletti, G.* Mod. Mm. S. It. 19 (1821) (Mt.) 330-.
- , —, streams. *Focacci, F.* Mod. S. It. Mm. 13 (1807) 390-.
- , —, *Delprat, J. P.* Amst. N. Vh. 10 (1844) 157-; Amst. Vh. 3 (1850) 55-.
- , —, at various depths, apparatus for measuring. *Ritter, C.* As. Fr. C. B. (1889) (Pt. 2) 379-.
- , —, —, investigated by Brünings' measurements. *Hagen, G. H. L.* Berl. Ak. Ab. (1883) (Mth., Ab. 1) 79 pp.
- , —, instrument for measuring. *Müller, W.* Dingler 304 (1897) 8-.
- subaqueous, graphic representation (Humphreys and Abbot). *Fambri, P., & Revy, J. J.* Rm. R. Ac. Linc. T. 2 (1878) 149-.
- of water in torrents and under glaciers, experiments. *Vallot, (Mme.) G., & Vallot, J.* Mt. Blanc Obs. A. 4 (1900) 19-.

Water measurer, theory. *Savinère, É.* Gén. Civ. 9 (1886) 214-.

## Elastic Deformation 0840

### 0840 Elastic Deformation of Solids. Compressibility and Rigidity. Elongation and Flexure, Young's Modulus.

(See Mechanics :

- 3200 Elasticity, general.
- 3210 Strain and stress. Stress-strain relations. Strain-energy. Æolotropy. Crystals.
- 3220 Equations of elastic deformation and motion. General solutions. Special solutions. Vibrations.
- 3230 Torsion and flexure of prisms.
- 3240 Elastic rods and wires; springs.
- 3245 Elastic frameworks.
- 3250 Elastic plates and shells.
- 3260 Impact and rebound. Travelling loads.
- 3270 Stability of elastic systems.
- 3280 Principles of construction, including approximate formulæ for resistance of materials.)

Experimental determination of elastic constants.

(See also Mechanics 3600, 3630, 3650.)

### CAOUTCHOUC.

- Gough, J.* [1803] Manch. Ph. S. Mm. 1 (1805) 288-.
- contraction by heat. *Gezekhus [Hesekus], N. A.* (xii) Rs. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 103-; J. de Ps. 3 (1884) 459-.
- elasticity. *Villari, E.* (xi) N. Cim. 1 (1869) 332-, 361-.
- and thermal expansion. *Graetz, L.* A. Ps. C. 28 (1886) 354-.
- physical properties. *Lundal, A. E.* A. Ps. C. 66 (1898) 741-.
- Poisson's ratio for. *Röntgen, W. C.* A. Ps. C. 159 (1876) 601-.
- , —, *Bellati, M., & Naccari, A.* Ven. I. At. 3 (1877) 679-.
- , —, *Amagat, E. H.* C. R. 99 (1884) 130-.
- , —, and after-effect. *Pulfrich, C.* A. Ps. C. 28 (1886) 87-.
- stress-strain relations. *Thurston, R. H.* Science 6 (1897) 758-; 7 (1898) 522-.
- , —, *Broomall, C. M.* Science 8 (1898) 673-.
- temperature, effect on elasticity. *Schmulewitsch, J.* [1869] St. Pét. Ac. Sc. Bll. 14 (1870) 517-.

- temperature, effect on elasticity. *Erner, F.* [1873] (ix) Wien Ak. Sb. 69 (1874) (Ab. 2) 102-.
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- , sources of error in experiments. *Tomlinson, H.* L. Ps. S. P. 8 (1887) 90-; Ph. Mg. 22 (1886) 414-.
- Wires, modulus, and definition of "softness." *Bouasse, H.* C. R. 126 (1898) 466-; A. C. 14 (1898) 98-.
- , — of oscillating wire. *Berson, G., & Bouasse, H.* C. R. 119 (1894) 48-.
- , permanent torsion, change due to change of temperature. *Bosanquet, R. H. M.* L. Ps. S. P. 9 (1888) 49-; Ph. Mg. 24 (1887) 160-.
- , —, —, —, —, —. *Tomlinson, H.* L. Ps. S. P. 9 (1888) 87-; Ph. Mg. 24 (1887) 253-.
- Wires, specific resistance, dependence on tension. *Benton, J. R.* A. Ps. 3 (1900) 471-.
- , temperature, effect on modulus. *Baile, —.* As. Fr. C. R. (1884) (Pt. 1) 158.
- Triangular rods, experiments. *Bornemann, K. R.* Civing. 1 (1854) 186-.
- Volume in elastic bodies, variation. *Cesàro, E.* Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 2) 259-.

## WIRES.

(See also Torsion, and Mechanics 3240.)

- Garconot, E.* St. Ét. Bll. S. In. Mn. 9 (1880) 695-; 11 (1882) 827-.
- Mercadier, —.* Par. Éc. Pol. J. 58 (1888) 155-; C. R. 108 (1889) 344-.
- Searle, G. F. C.* Ph. Mg. 49 (1900) 193-.
- Wimperis, H. E.* Ph. Mg. 50 (1900) 416-.
- galvanised iron and steel, torsion and flexure. *Müller, E.* Dingler 253 (1884) 454-.
- iron (of suspension bridges), elasticity and cohesion. *Brix, A. F. W.* Dingler 66 (1837) 334-.
- , elasticity and strength. *Giulio, C. I.* Tor. Mm. Ac. 3 (1841) 275-.
- , German and Swedish. *Käl, A.* Oestr. Z. Brgw. 36 (1888) 478-, 493-.
- under strain, effect of raising to red heat. *Tomlinson, H.* L. Ps. S. P. 9 (1888) 71-; Ph. Mg. 24 (1887) 256-.
- (soft) under stress. *Ewing, J. A.* R. S. P. 30 (1890) 510-.
- for ropes, modulus. *Käl, A.* Oestr. Z. Brgw. 33 (1885) 353-, 373-.
- secular experiments on elasticity. *Brit. Ass. Comm.* B. A. Rp. (1879) 33-; (1880) 61-.
- , —, —. *Bottomley, J. T.* B. A. Rp. (1886) 537-.
- stretched, lateral contraction. *Göts, H., & Kurz, A.* Exner Rpm. 22 (1886) 9-, 274-, 511-; 23 (1887) 521-.
- tension. *Gounelle, E.* A. Tél. 1 (1858) 57-.
- thermal expansion and contraction under tension. *Wehage, H.* Civing. 25 (1879) 619-.
- , —, —, —. *Bottomley, J. T.* Ph. Mg. 24 (1887) 314-.
- under tension. *Bottomley, J. T.* L. Ps. S. P. 10 (1890) 184-; Ph. Mg. 28 (1889) 94-.
- , —, —. *Olearski, K.* Krk. Ak. (Mt.-Prz.) Rz. 1 (1891) 166-; Cr. Ac. Sc. Bll. (1890) 139-.
- variations of elasticity and internal viscosity. *Gray, A., Blyth, V. J., & Dunlop, J. S.* [1900] R. S. P. 67 (1901) 180-.
- Young's modulus and change of length by magnetisation, interference method. *Shakespeare, G. A.* Ph. Mg. 47 (1899) 539-.
- for piano wire, influence of heat and electric current. *Noyes, M. C.* Ps. Rv. 2 (1895) 277-.
- Wood, different kinds. *Hoh, T.* (xii) Bamb. Nf. Gs. B. (11) (1876) (Pt. 1, No. 3) 17 pp.
- Zinc, elasticity at different temperatures. *Zimansky, E.* A. Ps. C. 54 (1895) 189-.

## 0842 Compressibility of Liquids.

- Colladon, D., & Sturm, C.* [1827] Par. Mm. Sav. Étr. 5 (1838) 267-.
- (Colladon & Sturm.) *Barlocci, S. G.* Acad. 36 (1827) 308-.
- Ørsted, H. C.* Kiøb. Ov. (1827-28) 14-; Pogg. A. 12 (1828) 158-.
- Aimé, G.* C. R. 16 (1843) 1165-; A. C. 8 (1843) 257-.
- Despretz, C.* C. R. 21 (1845) 216-.
- Grassi, C.* C. R. 27 (1848) 153-.
- Soret, J. L.* Bb. Un. Aroh. 16 (1851) 290-.
- Chase, P. E.* Camb. (U.S.) Mth. M. 2 (1860) 25-.
- Jamin, —, Amaury, —, & Descamps, C.* C. R. 66 (1868) 1104-.
- (Method of Jamin, Amaury and Descamps.)
- Dupré, A.* C. R. 67 (1868) 392-.
- Amaury, —, & Descamps, —.* C. R. 68 (1869) 1564-.
- Descamps, C.* Rv. Cours Sc. 3 (1872) 21-.
- Amagat, E. H.* C. R. 85 (1877) 27-, 139-; A. C. 11 (1877) 520-.
- Avenarius, M.* St. Pét. Ac. Sc. Bll. 24 (1878) 525-.
- Quincke, G. H.* A. Ps. C. 19 (1883) 401-.
- Pagliani, S., & Palazzo, L.* Rm. R. Ac. Linc. Mm. 19 (1884) 273-.
- Pagliani, S., & Vicentini, G.* N. Cim. 16 (1884) 27-, 161-.
- Guillaume, C. É.* C. R. 103 (1886) 1183-.
- Langlois, M.* As. Fr. C. R. (1887) (Pt. 2) 334-.
- Puschl, C.* Wien Ak. Sb. 96 (1888) (Ab. 2) 1028-.
- Barus, C.* U. S. Gl. Sv. Bll. No. 92 (1892) 96 pp.
- Tait, —.* Edinb. R. S. P. 20 (1895) 245-.
- Compressibility at high pressures. *Cailletet, L.* C. R. 75 (1872) 77-.
- — — — — *Tait, P. G.* [1883] Edinb. R. S. P. 12 (1884) 223-.
- — — — — temperatures. *Ørsted, H. C.* [1826] Edinb. J. Sc. 6 (1827) 201-.
- and molecular pressure of liquids. *Tait, P. G.* Edinb. R. S. P. 20 (1895) 63-, 141-.
- — surface tension of liquids. *Devauz, —.* [1892] Bordeaux S. Sc. Mm. 4 (1894) ii-.
- Compression, thermal effects (water). *Ørsted, H. C.* Kiøb. Dn. Vd. Selsk. Afh. 12 (1846) cxiv-.
- — — — — *Joule, J. P.* [1858] Phil. Trans. (1859) 133-.
- — — — — *Puschl, P. C.* Wien Az. 25 (1889) 123-.
- — — — — (water). *Galopin, P.* C. R. 114 (1892) 1525-.
- — — — — (—). *Tait, —.* Edinb. R. S. P. 19 (1893) 133-.
- — — — — (solutions). *Tammann, G.* Z. Ps. C. 13 (1894) 174-.
- Equation of van der Waals, application. *Tait, —.* Edinb. R. S. P. 20 (1895) 285-.
- Influence of temperature. *Heen, P. de.* Brux. Ac. Bll. 9 (1885) 550-.
- Laws. *Amagat, E. H.* C. R. 115 (1892) 638-.
- — — — — *Tumlirz, O.* Wien Ak. Sb. 109 (1900) (Ab. 2a) 837-.

## MEASUREMENT OF COMPRESSIBILITY.

- Amagat, E. H.* Arch. Sc. Ps. Nt. 16 (1886) 181-.
- Tait, —.* Edinb. R. S. P. 13 (1886) 2-.
- apparatus (for water, piezometer). *Perkins, J.* Phil. Trans. (1820) 324-.
- (—). *Ørsted, H. C.* Kiøb. Ov. (1821-22) 6-; Schweigger J. 36 (=Jb. 6) (1822) 332-.
- *Pfaff, C. H.* Gilbert A. 72 (1822) 161-.
- (for water, Ørsted). *Hachette, J. N. P.* Par. S. Phlm. Bll. (1823) 46-.
- (—). *Ørsted, H. C.* (vi Adds.) Mg. Phm. 2 (1823) 139-.
- (—, Ørsted). *Magrini, L.* Mil. At. Aten. 2 (16) (1860-61) 58-.
- (piezometer). *Mees, R. A.* Amst. Ak. Vs. M. 19 (1884) 187-.
- *Skinner, S.* [1891] L. Ps. S. P. 11 (1892) 147-; Ph Mg. 32 (1891) 79-.
- (isentropic and isothermal compressibility of liquids and solids). *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 1) 149-.
- (piezometer to compress and extend liquids). *Pizzarello, A.* N. Cim. 8 (1898) 266-.
- and dilatation. *Amagat, E. H.* C. R. 111 (1890) 871-.
- eliminating volume-change of containing vessel. *Guillaume, C. É.* Arch. Sc. Ps. Nt. 17 (1887) 177-.
- — — — — *Boguski, J. J.* Kosmos (Lw.) 13 (1888) 243-; Z. Ps. C. 2 (1888) 120-.
- influence of heat of compression. *Röntgen, W. C.* A. Ps. C. 45 (1892) 560-.
- Jamin's method, using Regnault's manometer. *Mees, R. A.* Amst. Ak. Vs. M. 14 (1879) 108-; 15 (1880) 218-.

## VARIOUS LIQUIDS.

- Ammonium chloride solutions. *Braun, F.* A. Ps. C. 31 (1887) 331-.
- Aqueous chloride solutions. *Schumann, M.* A. Ps. C. 31 (1887) 14-.
- Ethyl alcohol, volume-extensibility. *Worthington, A. M.* [1892] Phil. Trans. (A) 183 (1893) 355-.
- Hydrocarbons. *Elenev, A. S.* (xii) Bs. C. Ps. S. J. 5 (Pt. 1) (1873) 109-.
- *Bartoli, A.* Mil. I. Lomb. Rd. 23 (1895) 1141-.
- and alcohols, compressibility, tension coefficients and specific heats. *Pagliani, S.* Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 885-.
- Mercury. *Langlois, M.* C. R. 103 (1886) 1009-.
- , compressibility, and elasticity of glass. *Amagat, E. H.* C. R. 108 (1889) 228-.
- , —, — — — — solids. *Amagat, E. H.* J. de Ps. 8 (1889) 197-, 359-; A. C. 22 (1891) 95-; Par. S. Ps. 84. (1891) 102-.

## 0842 Liquids, Compressibility

- Mercury, and glass. *Metz, G. de.* [1890] N. Rs. S. Nt. Mm. (*Mth.*) 13 (1891) 109-; A. Ps. C. 47 (1892) 708-.
- Oils and colloids. *Metz, G. de.* Rs. Ps.-C. S. J. 22 (*Ps.*) (1890) 128-; A. Ps. C. 41 (1890) 663-.
- Organic liquids. *Röntgen, W. C.* A. Ps. C. 44 (1891) 1-.
- Potassium and calcium chlorides, solutions. *Drecker, J. A.* Ps. C. 34 (1888) 952-.
- Saline solutions. *Schneider, J.* Giessen Oberh. Gs. B. 25 (1887) 1-.
- — — *Gilbault, H.* C. R. 114 (1892) 209-.
- — —, dilute, and solid sodium chloride. *Röntgen, W. C., & Schneider, J.* A. Ps. C. 31 (1887) 1000-.
- Solutions. *Gilbault, H.* Toul. Fac. Sc. A. 11 (1897) B, 63 pp.
- , compressibility, relation to that of constituents. *Braun, F. A.* Ps. C. 32 (1887) 504-.
- Sugar solutions. *Tait, —.* Edinb. R. S. P. 22 (1900) 359-.
- Sylvin, rock salt, and potassium chloride solutions. *Röntgen, W. C., & Schneider, J.* A. Ps. C. 34 (1888) 531-.

## Water.

- Örsted, H. C.* Kiøb. Ov. (1817-18) 11-; Schweigger J. 21 (1817) 348-.
- Perkins, J.* Phil. Trans. (1820) 324-.
- (*Perkins.*) *Deuchar, J.* Tilloch Ph. Mg. 58 (1821) 201-.
- (—) *Roget, P. M.* Thomson A. Ph. 1 (1821) 135.
- (— and *Örsted.*) *Barlocchi, S. G.* Arcad. 20 (1823) 338-.
- Clément, —.* Par. S. Phlm. Bl. (1823) 28-.
- Örsted, H. C.* A. C. 38 (1828) 326-; Kiøb. Ov. (1832-33) 16-; Pogg. A. 31 (1834) 361-; B. A. Rp. (1833) 353-.
- Rankine, W. J. M.* Edinb. R. S. P. 3 (1857) 58-.
- Anderssohn, A. D.* Nf. Tbl. (\*1868) 95-.
- Tait, P. G.* [1882] Edinb. R. S. P. 12 (1884) 45-.
- Pagliani, S., & Vicentini, G.* (xii) Rv. Sc.-Ind. 15 (1883) 282; N. Cim. 16 (1884) 27-, 161-.
- Tait, P. G.* Edinb. R. S. P. 12 (1884) 757-.
- Langlois, M.* C. R. 102 (1886) 1451-.
- Amagat, E. H.* C. R. 104 (1887) 1159-.
- Röntgen, W. C., & Schneider, J.* A. Ps. C. 33 (1888) 644-.
- Amagat, E. H.* C. R. 116 (1893) 41-; Par. S. Ps. Sé. (1893) 145-.
- and alcoholic mixtures. *Pagliani, S.* Rm. R. Ac. Linc. Rd. 5 (1889) (*Sem.* 1) 777-, 937.
- compressibility and elasticity. *Araldi, M.* Bologna Mm. I. It. 2 (1898) 327-.
- , practical applications. *Forbes, J. D.* Edinb. N. Ph. J. 19 (1835) 36-.
- ; and thermoelectricity. *Örsted, H. C.* Par. S. Phlm. Bl. (1823) 45-.
- compression bathometer. *Regnard, P.* Par. S. Bl. Mm. 45 (1893) (*C. R.*) 6-.

## Values of Densities 0845

- compression, progressive. *Perkins, J.* Phil. Trans. (1826) 541-.
- , theoretical rule. *Mac Kain, D.* Glasg. P. Ph. S. 1 (1841-44) 249-.
- elasticity. *Busse, F. G. von.* Gilbert A. 20 (1805) 504-.
- , mechanical effects. *Mensbrugge, G. van der.* Rv. Quest. Sc. 45 (1899) 580-.
- and ether. *Amagat, E. H.* C. R. 103 (1886) 429-.
- ethyl alcohol mixtures. *Pagliani, S., & Palazzo, L.* Tor. Ac. Sc. At. 19 (\*1883) 1017-.
- at high temperature. *Barus, C.* Am. J. Sc. 41 (1891) 110-.
- incompressibility. *Anderssohn, A. D.* Nf. Tbl. (\*1868) 95-.
- and paratoluidine. *Hulett, G. A.* Z. Ps. C. 33 (1900) 237-.
- salt solutions. *Tait, —.* Edinb. R. S. P. 15 (1889) 84.
- at different temperatures. *Rankine, W. J. M.* Ph. Mg. 1 (1851) 548-.

## 0845 Numerical Values of Mechanical Quantities (Density, Gravitation, etc.).

## DENSITY.

(See also Chemistry 7115.)

- Air. *Agamennone, G.* Rm. R. Ac. Linc. Rd. 1 (1885) 111-.
- , liquid, and its components. *Wroblewski, S.* C. R. 102 (1886) 1010-.
- , —, — other liquefied gases. *Ladenburg, A., & Krügel, C.* Berl. B. 32 (1899) 46-, 1415-.
- Alcohol, pure. *Pierre, J. I.* C. R. 76 (1878) 336-.
- , table for dilution. *Anon.* Manch. Mer. S. T. (1891) 74.
- Alloys, change in volume density. *Kosmann, B.* Berg.-Hm. Ztg. 54 (1895) 51-.
- Animal substances. *Kapff, —, & Schübler, —.* Erdm. J. Tech. C. 14 (1832) 89-.
- Argon and helium, density, refractivity and viscosity. *Rayleigh, (Lord).* R. S. P. 59 (1896) 198-.
- Bismuth, fused. *Roberts-Austen, W. C., & Wrightson, T.* L. Ps. S. P. 4 (1881) 195-; Ph. Mg. 11 (1881) 295-.
- , —, anomalous densities. *Luedeking, C.* St. Louis Ac. T. 5 (1892) 292-.
- Brass, zinc, copper and iron, homogeneity. *Hennig, R.* A. Ps. C. 27 (1886) 321-; 28 (1886) 696.
- Cæsium. *Menke, A. E.* Am. C. S. J. 21 (1899) 420-.
- Calcium sulphate. *McCaleb, J. F.* Am. C. J. 11 (1889) 35-.
- Carbon dioxide, solid and liquid. *Behn, U.* A. Ps. 3 (1900) 733-.
- Carbonic oxide, carbonic anhydride and nitrous oxide. *Rayleigh, (Lord).* R. S. P. 62 (1898) 204-.





## 0845 Values of Densities

- Platinum, iridium, and platinum-iridium, physical properties. *Stas*, —. *Par. Poids et Mes. PV.* (\*1877) 6-.
- metals and alloys, densities and expansions. *Broch, O. J.* *Par. Poids et Mes. PV.* (\*1877) 209-.
- Saline solutions. *Gerosa, G. G., & Mai, E.* *Rm. R. Ac. Linc. Mm.* 4 (1887) 134-.
- Salts, various. *Clarke, F. W.* *Am. J. Sc.* 16 (1878) 199-; *Berl. B.* 12 (1879) 1398-; *Am. C. J.* 5 (1883-84) 240-.
- Selenium. *Schaffgotsch, F. von.* *Berl. B.* (1847) 422-; *Pogg. A.* 90 (1853) 66-.
- Soda and potash, solutions. *Pickering, S. U.* *Ph. Mg.* 37 (1894) 359-.
- Sodium chloride, pure. *Unger, U. von.* *Erdm. J. Pr. C.* 8 (1836) 294-.
- Solids, densities, influence of state of division. *Schiff, H. C.* *Ztg.* 10 (1886) 430.
- and liquids. *Clarke, F. W.* [1873] (ix) *Smiths. Misc. Col.* 12 (1874) *Art.* 2, 272 pp.; 82 (1888) *Art.* 1, xi + 409 pp.
- Steam. *Tralles, J. G.* *Gilbert A.* 27 (1807) 400-.
- *Schmedding, G. J.* *Pogg. A.* 27 (1833) 40-.
- *Rankine, W. J. M.* *Glasg. T. I. Eng.* 3 (1859-60) 53-.
- *Schmidt, G.* *Dingler* 160 (1861) 262-.
- *Rankine, W. J. M.* [1862] (viii) *Edinb. R. S. T.* 23 (1864) 147-.
- Steel, effect of tempering. *Fromme, C. A.* *Ps. C.* 8 (1879) 352-.
- , homogeneity. *Gruner, P. A.* *Ps. C.* 41 (1890) 334-.
- Substances in solid state and in aqueous solution. *Groshans, J. A.* *Ph. Mg.* 18 (1884) 405-.
- Sulphur vapour. *Biltz*, —. *Nt.* 38 (1888) 229.
- *Schall, C.* *Berl. B.* 33 (1900) 484-.
- , and progressive dissociation. *Riecke, E.* *Z. Ps. C.* 6 (1890) 430-.
- Sulphuric acid, concentrated. *Kohlrausch, W. F.* *A. Ps. C.* 17 (1882) 69-.
- , dilute, density and composition. *Rücker, A. W.* *Ph. Mg.* 32 (1891) 304-; 33 (1892) 204-.
- solutions. *Pickering, S. U.* *Ph. Mg.* 33 (1892) 132-.
- Sulphurous anhydride as liquid and saturated vapour. *Cailletet, L., & Mathias, E.* *J. de Ps.* 6 (1887) 414-.
- Tellurium. *Lenher, V., & Morgan, J. L. R.* *Am. C. S. J.* 22 (1900) 28-.
- Vapours at high temperatures. *Sainte-Claire Deville, H., & Troost, L. A. C.* 58 (1860) 257-.
- — — *Bott, W. B. A.* *Rp.* (1888) 632-.
- — — *Scott, A.* *Edinb. R. S. P.* 14 (1888) 410-.
- , saturated, and liquefied gases. *Cailletet, L., & Mathias, E.* *J. de Ps.* 5 (1886) 549-.
- Wood, various kinds. *Karmarsch, K.* *Wien Jb. Pol. I.* 18 (1834) 120-.
- Woods, principal industrial. *Filippo, P.* *Mil. S. It. At.* 25 (1882) 105-.
- Zinc vapour. *Mensching, J., & Meyer, V.* *Gött. Nr.* (1887) 7-.

## Heat, General 0900

### GRAVITATION.

(See *Mechanics* 0180, pp. 59-66.)

### HEAT.

#### 0900 General.

- Perego, A.* *Brescia Cm.* (1816-17) 58-.
- A. X.* (vi *Adds.*) *Silliman J.* 10 (1826) 78-.
- Dove, H. W.* (vi *Adds.*) *Berl. Pol. Ga. Vh.* 17 (1856) 264-.
- Caloric (ponderability). *Tilloch, A.* *Tilloch Ph. Mg.* 9 (1801) 158-.
- hypothesis. *Girard de Caudenberg*, —. *Bordeaux Ac. Sc. Sé. Pbl.* (1831) 36.
- , leading doctrines. *Ure, Andr.* *Phil. Trans.* (1818) 338-.
- , mode of action. *Prevost, P.* *Bb. Brit.* 26 (1804) 205-, 309-.
- and molecular mechanics. *Girard de Caudenberg*, —. *Dijon Ac. Mm.* (1830) 5-, (livr. 2) 3-.
- , received doctrines. *Tilloch, A.* [1799] *Tilloch Ph. Mg.* 8 (1800) 70-, 119-, 211-.
- of vacuum. *Gay-Lussac, L. J.* *A. C.* 13 (1820) 304-.
- Heat, action on bodies, importance of study. *Cantoni, G.* *Rm. R. Ac. Linc. Rd.* 7 (1891) (Sem. 2) 438-.
- , early history. *Rodwell, G. F. C.* *N.* 20 (1869) 184-.
- , experiments, reflexions derived from. *Wünsch, (Prof.)* —. *Gilbert A.* 26 (1807) 289-.
- , nature. *P.*, —. *Tilloch Ph. Mg.* 12 (1802) 317-.
- , ponderability. *Rumford, B. (Count).* *Phil. Trans.* (1799) 179-.
- , —. *Hombres-Firmas, L. A. d'.* *Gard Not. Tr. Ac.* (1811) 138-.
- , —. *Moscatti, P.* *Bb. Brit.* 46 (1811) 405-.
- , —. *Tarbé de St. Hardouin*, —. *Reims A. Ac.* 1 (1843) 257-.
- , synthesis. *Pictet, R.* *Arch. Sc. Ps. Nt.* 2 (1879) 460-.
- , theory. *Ostrogradsky, M. A.* [1829] *St. Pét. Ac. Sc. Mm.* 1 (1831) 123-, 129-.
- , —. *Ångström, A. J.* *Sk. Nf. F.* 3 (1842) 433-; *Pogg. A.* 88 (1853) 165-.
- , —, and applications to arts and manufactures. *MacDonnell, A.* [1873] *Dubl. S. J.* 6 (1875) 494-.
- , —, Regnault's experiments. *Bosscha, J.* *Amst. Ak. Vs.* [1] (1893) 180-.
- Imponderables, theory. *Bellavitis, G.* *Ven. I. At.* 1 (1874-75) 495-.
- , — (Bellavitis). *Rossetti, F.* *Ven. I. At.* 1 (1874-75) 779-.
- Physical and chemical phenomena at low temperatures. *Pictet, R.* *C. R.* 114 (1892) 1245-.
- Temperature of lava erupted by Etna. *Bartoli, A.* *Catania Ac. Gioen. Bll.* 29 (1892) 2-; *Mil. I. Lomb. Rd.* 29 (1896) 363-.

## SOURCES OF HEAT AND COLD.

## 1000 General.

- Calorific power of some solid combustibles, determined by calorimeters of Mahler and Thompson. *Cavazzi, A., & Baroni, G.* [1895] Bologna Ac. Sc. Mm. 6 (1896-97) 217- or 137-.
- value of fuels, steam boiler tests as means of determining. *Robb, D. W.* [1890] N. Scotia I. Sc. P. & T. 8 (1895) 9-.
- Cold. *Payer, J.* [1875] Wien Vr. Nw. Kennt. Schr. 16 (1876) 131-.
- Combustion, experiments and views. *Grotthuss, T. von.* Schweigger J. 9 (1813) 327-.
- Fire by compression of air. *Accum, F.* Tilloch Ph. Mg. 31 (1808) 130-.
- making, methods. *Hough, W.* Smiths. Rp. (1890) (*U. S. Nat. Ms. Rp.*) 395-.
- Flame contact and heating of water. *Fletcher, T.* Nt. 34 (1886) 230-.
- Fuel, economic use on scientific principles. *Precht, J. J.* Haarl. Ntk. Vh. Mtsh. 3 (1806) 1-.
- Heat developed by friction. *Becquerel, A. C.* C. R. 7 (1838) 363-; Par. Mm. de l'I. 17 (1840) 181-.
- — — — *Hirn, G. A., & Séguin,* —. Moigno Cosmos 6 (1855) 679-.
- — — — between liquids and solids. *Maschke, O.* A. Ps. C. 146 (1872) 431-.
- HEAT DEVELOPED ON MOISTENING SOLIDS, POUILLET'S PHENOMENON.**
- Pouillet, C. S. M.* A. C. 20 (1822) 141-.
- Fibrous substances. *Cobbett, L.* Camb. Ph. S. P. 10 (1900) 372-.
- Porous solids. *Cantoni, G.* Mil. I. Lomb. Rd. 3 (1866) 135-.
- Powders. *Meissner, F.* A. Ps. C. 29 (1866) 114-.
- *Martini, T.* Ven. I. At. (1896-97) 502-.
- *Lagergren, S.* [1898] Stockh. Ak. Hndl. Bh. 24 (*Afd. 2*) (1899) No. 5, 14 pp.
- *Martini, T.* Ven. I. At. (1897-98) 927-.
- *Ercolini, G.* N. Cim. 9 (1899) 110-.
- (*Ercolini*). *Martini, T.* N. Cim. 9 (1899) 334-.
- (*Martini*). *Ercolini, G.* N. Cim. 9 (1899) 446-.
- (*Ercolini*). *Martini, T.* N. Cim. 10 (1899) 42.
- *Martini, T.* Ven. I. At. (1899-1900) (*Pt. 2*) 615-.
- *Bellati, M.* Ven. I. At. (1899-1900) (*Pt. 2*) 931-.
- Heat equivalent of fossil combustibles, industrial apparatus for. *Magnanini, G., & Zunino, V.* Mod. Ac. Sc. Mm. 2 (1900) 117-.
- excited by solar rays. *Rumford, B. (Count)*. [1805] Par. Mm. de l'I. 6 (1806) 123-; Gilbert A. 20 (1805) 177-.
- generation. *Örsted, H. C.* Schweigger J. 5 (1812) 401-.

- Heat as introduction to study of temperature. *Hauvel,* —. Fr. S. Mét. An. 44 (1896) 139-.
- and light, new means of producing. *Sullivan, J. L.* Silliman J. 1 (1818) 91-.
- — — — production by compression. *Hombres-Firmas, L. A. d'.* Gard Not. Tr. Ac. (1811) 175-.
- produced by blast of air from bellows. *Winter, R.* Nicholson J. 13 (1806) 72-.
- — — — — *D., K. H.* (vi *Adds.*) Nicholson J. 13 (1806) 170-.
- — — — compression of air. *Bellani, A.* Poligrafo 10 (1832) 321-.
- — — — with platinum black. *Bellani, A.* Poligrafo 10 (1832) 321-.
- — — — sources. *Knoblauch, H.* Pogg. A. 71 (1847) 58-.
- — — — natural and artificial. *Daubrée, A.* Par. S. Gl. Bil. 4 (1846-47) 1056-.
- Ice caverns of Naye, Switzerland, origin of ice. *Dutoit,* —, & *Blanc, V. L.* Laus. S. Vd. Bil. 32 (1896) xxx-.
- Magnetism, direct production of heat by. *Grove, W. R.* R. S. P. 5 (1849) 826-.
- Petroleum as source of power. *Clark, N. B.* Franklin I. J. 117 (1884) 341-.
- Regeneration of heat in gas ovens. *Hennecart,* —. [1883] St. Ét. Bil. S. In. Mn. 13 (\*1884) 198-.
- Sensible temperature. *Prinsep, J.* Gleanings Sc. 2 (1830) 137-.
- Ships' boilers, new method of closing in. *Sjösten, C. J.* Stockh. Ak. Hndl. 27 (1906) 94-.
- Solar heat, applications. *Ligin, V.* N. Rs. S. Nt. Mm. (*Mth.*) 4 (\*1883).
- — — — mechanical effect on confined air. *Mouchot,* —. C. R. 59 (1864) 527.
- — — — use as motive force. *Haro, A.* Nancy S. Sc. Bil. 3 (10<sup>e</sup> Ann.) (1877) 91-.
- — — — with plane reflector. *Güntner, C.* [1875] Wien Ak. Sb. 72 (1876) (*Ab. 2*) 713-.
- — — — to replace fuel in certain countries. *Mouchot,* —. C. R. 67 (1868) 1182-.
- Temperature in flames. *Mache, H.* Wien Ak. Sb. 106 (1899) (*Ab. 2a*) 1152-.
- Terrestrial heat, cause determining reproduction. *Ponte, S. G.* [1880] Catania Ac. Gioen. At. 15 (1881) 27-.
- Trials by fire, etc., apparatus for. *Rochas d'Aigun, E. A. A. de.* Rv. Sc. 4 (1882) 344-.
- Tyndall's "Lectures on Force and Heat," passage in. *Heath, D. D.* Ph. Mg. 25 (1863) 531-.

## 1010 Methods of Producing High Temperatures.

(See also 6090.)

- Debray, H.* Presse Sc. 1 (1863) 59-.
- Goldschmidt, H.* [1898-99] Z. Angew. C. (1898) 821-; Z. Elektch. (1899-1900) 53-.
- Lange, E. F. I. & S. I. J.* (1900) No. 2) 191-.

- Aluminium, combustion. *Goldschmidt, H. Z. Elektch.* (1897-98) 494-; *Z. Angew. C.* (1900) 919-.
- Apparatus for maintaining incandescence of platinum in water. *Paquelin, —. C. R.* 113 (1891) 384-.
- — rendering surgical instrument incandescent. *Baj, —. C. R.* 113 (1891) 298-.
- Blast-furnace, theory of use of hot air. *Valérius, H. Brux. Ac. Bll.* 39 (1875) 370-.
- Blow-pipe, new form. *Paquelin, —. C. R.* 113 (1891) 303-.
- Bunsen flame, constitution. *Terquem, A. Par. S. Ps. Sé.* (1880) 189-.
- and monochromatic burners. *Terquem, A. C. R.* 90 (1890) 1484-.
- Calorifactor, Ougrimoff electric. *Montpellier, J. A.* [1900] *Sc. Abs.* 4 (1901) 92-.
- Central heating, Bamberg. *Hoh, T. (xii) Bamb. Nf. Gs. B.* (11) (1876) (Pt. 1, No. 2) 16 pp.
- Chimneys, utilisation of heat in. *Edelcrantz, A. N. Stockh. Ak. Hndl.* 33 (1812) 24-.
- Dense atmosphere, production of high temperature in. *Cailletet, L. C. R.* 106 (1888) 333-.
- Fireplaces, etc. *Fourmy, —. J. de Ps.* 84 (1817) 406-.
- , domestic, perfecting. *Forestier, C. Toul. Ac. Sc. Mm.* 7 (1875) 233-.
- and field cooking apparatus. *Sjöstén, C. J. Stockh. Ak. Hndl.* 28 (1807) 235-.
- used in barracks and hospitals, England. *Morin, A. J. C. R.* 59 (1864) 921-.
- Furnace, construction, use of incombustible material. *Haase, F. H. Dingler* 294 (1894) 18-, 232-.
- , dimensions of air passages. *Langlade, — de. A. Mines* 8 (1885) 172-.
- , gas, new laboratory. *Rössler, H. Cztg. Opt.* 6 (1885) 53.
- , —, Ponsard's. *Périssé, J. S. Par. Ing. Civ. Mm.* (1874) 752-.
- , —, and regenerated heat. *Krans, F. A. Gén. Civ.* 3 (1874) 36-, 101-, 162-, 316-, 514-.
- , —, regeneration of heat. *Boischevalier, A. de. Gén. Civ.* 3 (\*1882-83) 122-.
- , —, Siemens's. *Damour, E. A. Mines* 3 (1893) 84-.
- , —, —, regenerative, use of peat in. *Mac Donnell, A.* [1874] *Dubl. S. J.* 6 (1875) 503-.
- , —, temperature. *Périssé, J. S. Cuyper Rv. Un.* 38 (1875) 269-.
- , —, use of peat in, Motals, Sweden. *Sebenius, J. L. Jern-Kont. A.* 31 (1876) 227-.
- Gas and electricity as heating agents. *Siemens, (Sir) C. W. Nt.* 23 (1881) 326-, 351-.
- , illuminating, as fuel. *Baer, W. Halle Z.* 3 (1854) 380-, 471-.
- stoves, improvements. *Adams, J. Glasg. Ph. S. P.* 12 (1880) 190-.
- supply for heating and illumination. *Siemens, (Sir) C. W. Nt.* 24 (1881) 153-.
- Goldschmidt's* experiments. *Zehenter, J. Innsb. Nt. Md. B.* 25 (1900) xii-.
- Heat, production and industrial utilisation. *Gautier, F.* [1883] *Gén. Civ.* 4 (\*1883-84) 90-.
- Heat, production and industrial utilisation. *Damour, E., & Waton, —. Gén. Civ.* 31 (1897) 66-, 115-.
- , — — — —. *Damour, E. Gén. Civ.* 31 (1897) 324-, 405-, 417-; 32 (1897-98) 4-, 22-, 46-; 33 (1898) 108-.
- ; utilisation in furnaces. *Damour, E. A. Cons. Arts et Mét.* 1 (1899) 51-.
- Heating apparatus (Pimont). *Boutan, A. Rouen Tr. Ac.* (1850-51) 72-.
- High temperature furnace. *Gantt, H. L. Franklin I. J.* 142 (1896) 458-.
- Hygrothermant for heating wine out of contact with air. *Ballé, M. Mth. Termt. Ets.* 3 (1885) 221-; *Mth. Nt. B. Ung.* 3 (1884-85) 255-.
- Intense heat from gas. *Brewster, (Sir) D.* [1826] *Edinb. J. Sc.* 1 (1829) 104-.
- Lenses and mirrors for burning instruments and lighthouses. *Brewster, (Sir) D.* [1823-27] *Edinb. Ph. J.* 8 (1823) 160-; *Edinb. R. S. T.* 11 (1831) 33-.
- Producer-gas, formation. *Akerman, R. Jern-Kont. A.* 46 (1891) 321-; *Berg-Hm. Jb.* 40 (1892) 81-.
- Ship stove, improved. *Collier, J. Tilloch Ph. Mg.* 32 (1808) 119-.
- Steam, communication of heat by. *Potts, C. Franklin I. J.* 5 (1830) 395-.
- , exhaust, waste heat utilisation. *Atkinson, J.* [1878] *Eng. S. T.* (1879) 167-.
- heating. *A., L. S. M. A. das Sc.* 12 (1821) 52-.
- , —, avoidance of loss of steam. *Scheeffer, A. Berl. Pol. Gs. Vh.* 17 (1856) 124-.
- — of liquids. *Gueymard, É. A. Mines* 5 (1829) 353-.
- Stoves for rooms, improvement. *Chauvin, E. As. Fr. C. R.* 12 (1883) 240-.
- Temperature, extremes, mechanical production. *Solvay, E. C. R.* 121 (1895) 1141-.
- , —, —. *Cailletet, —. C. B.* 121 (1895) 1143-.
- , —, —. *Solvay, E. C. R.* 122 (1896) 99-.
- limits. *Walden, P. Riga Cor.-Bl.* 39 (1896) 83-.
- , photographic means of recording. *Roberts-Austen, W. C. Phot. J.* 20 (1896) 225-.
- and pressure variables, long range. *Barus, C. Am. As. P.* (1897) 65-.
- of rooms. *Meidinger, —. [1896] Karlsruhe Nt. Vr. Vh.* 13 (1900) (Sb.) 30-.
- Thermolamps for houses, manufactories, etc. *Kretschmar, —. Gilbert A.* 13 (1803) 498-; 22 (1806) 85-.
- and their first inventor. *Gilbert, L. W. Gilbert A.* 22 (1806) 51-.
- Warming apparatus. *Pictet, M. A. Bb. Un.* 6 (1817) 166-.
- , —, theory. *Boltshauser, G. A. A. Gén. Civ.* 3 (1864) 514-.
- of buildings, apparatus. *Lanetz, —. Metz Ac. Mm.* 65 (1887) 238-.
- — —, comparison of different systems. *Bacon, A. J. Br. Archt. T.* (1890-81) 105-.

## 1010 Heating

- Warming of buildings, English methods. *Decandolle, A. P.* Bb. Un. 40 (1829) 142-.
- by motive force and electric current. *Lippmann, G.* Lum. Élect. 11 (1884) 421-.
- steam. *Hemptinne, A. D. de.* [1817] Brux. Mm. Cour. 1 (1818) 52 pp.
- , U. S. A. *Briggs, R.* [1882] I. CE. P. 71 (1883) 95-.
- carriages, etc., by crystallised sodium acetate. *Ancelin, A.* C. R. 93 (1881) 309-.
- conservatories. *Moll, G.* Hall Bij. 5 (1830) 121-.
- *Ainger, A.* (xii) Gard. Chron. (1841) 211-, 259-, 307-, 323-, 428-, 484-, 579-, 683-, 843-.
- by steam. *Bailey, W.* (vi Add.) Haarl. Ntk. Vh. Mtsch. 13 (1824) 199-.
- by hot air, advantages and disadvantages. *Fodor, J.* [1881] (xii) D. Vjschr. Gsndhpfl. 14 (1882) 118-.
- , apparatus. *Ducrot, —.* C. R. 76 (1873) 1537-.
- water. *Moll, G.* Hall Bij. 6 (1831) 354-.
- , —, best temperature and dimensions. *Weiss, T.* Förster Al. Bauztg. 33-34 (1868-69) 395-.
- pipes. *Colding, L. A.* Kjöb. Ov. (1862) 25-.
- , —, *Anderson, W.* I. CE. P. 48 (1877) 257-.
- , theoretical principles. *Grashof, F.* [1876] (xii) Karlsruhe Nt. Vr. Vh. 8 (1881) 60.
- of houses, development in future. *Meyer, M.* Erdm. J. Tech. C. 16 (1833) 307-.
- rooms. *Arzberger, J.* Wien Jb. Pol. I. 17 (1832) 1-.
- , —, *Osann, G.* Erdm. J. Pr. C. 12 (1837) 48-; 16 (1839) 226-.
- with stoves. *Blesson, L.* Erdm. J. Tech. C. 18 (1833) 281-.
- , —, *Meyer, M.* Erdm. J. Pr. C. 2 (1834) 439-.
- school buildings, Munich. *Forster, J., & Voit, E.* Z. Bl. 13 (1877) 1-, 305-.
- by steam, best temperature. *Weiss, T.* Förster Al. Bauztg. 33-34 (1868-69) 410-.
- , use of gas. *Elsner, R. W.* Dingler 126 (1852) 284-.
- and ventilation, Vincennes Military Hospital. *Grouvelle, P.* A. Gén. Civ. 1 (1862) 9-.
- Water, heating from surface. *Laborde, —.* C. R. 73 (1871) 561-.
- , — by waste steam (Woolf). *Nicholson, W.* Nicholson J. 2 (1802) 203-.
- Workshops, prevention of excessive heating. *Deny, E.* [1884] Mulhouse S. In. Bil. 55 (1885) 5-.

## Refrigeration 1012

## 1012 Methods of Producing Low Temperatures.

(See also 2495.)

- Olzewski, K.* C. R. 101 (1885) 238-.
- Air cooling in warm climates. *Smyth, C. P.* [1849] Edinb. R. S. P. 2 (1851) 235-.
- refrigerating machinery and its applications. *Coleman, J. J.* I. CE. P. 68 (1882) 146-.
- Alcarazas or Spanish water-cooling vessels. *Lasteyrie, —.* J. Mines 6 (1796-97) 791-.
- , —, *Guyton de Morveau, L. B.* A. C. 25 (1798) 167-.
- , —, *Fabbroni, G.* J. de Ps. 49 (1799) 228-.
- Apparatus. *Linde, C. A.* Ps. C. 57 (1896) 328-; Gén. Civ. 31 (1897) 35-, 51-; Z. Elektch. (1897-98) 2-.
- , recording. *Gibier, P.* C. R. 96 (1883) 1624-.
- Artificial cold, production. *Pepys, W. H.* Tilloch Ph. Mg. 3 (1799) 76-.
- , —, *Göppert, H. R.* Frieriep Not. 25 (1829) 85-.
- , —, and applications. *Witz, A.* [1891] Rv. Quest. Sc. 31 (1892) 78-.
- , —, use. *Richard, G.* A. Cons. Arts et Mét. 1 (1889) 133-.
- , use in exploitation of water-bearing strata. *Schmidt, F.* St. Ét. Bil. S. In. Mn. 9 (1895) 273-.
- Boiling oxygen as cooling agent. *Wroblewski, S. von.* Wien Az. 21 (1884) 6-; Mh. C. (1884) 47-.
- , —, *Olzewski, K.* Wien Az. 22 (1885) 129-; Mh. C. (1885) 493-.
- Carbon dioxide, solid, physical properties. *Nystrom, J. W.* Franklin I. J. 70 (1875) 355-.
- , —, properties. *Villard, P., & Jarry, R.* C. R. 120 (1895) 1413-; Par. S. Ps. 84 (1895) 177-.
- Cold air and freezing apparatus. *Perkins, L.* S. C. In. J. 8 (1889) 378-.
- producing machine. *Kirk, A. C.* [1864] Glasg. T. I. Eng. 3 (1865) 14-.
- , —, *Lebrun, B.* Rv. Un. Mines 18 (1892) 324-.
- , production, commercial. *Armengaud, J. A.* Rv. Sc. 18 (1890) 1023-.
- , —, mechanical. *Kirk, A. C.* I. CE. P. 37 (1874) 244-.
- , —, —, by expansion of air. *Armengaud, J. A.* I. CE. P. 39 (1875) 495-.
- , — by methyl chloride. *Vincent, C.* Par. S. Ps. 84 (1878) 20-; J. Phm. 30 (1879) 132-.
- , —, —, muriate of lime (calcium chloride). *Walker, Rich.* Phil. Trans. (1801) 120-.
- Compressed air, application. *Schneebeli, H.* [1875] Neuch. S. Sc. Bil. 10 (1876) 240-.
- Continuous process. *Cailletet, L.* C. R. 97 (1883) 1115-.
- Cooling machine for laboratory. *Turettini, H., & Pictet, R.* Par. Poids et Mes. PV. (\*1875-76) 123-.

## 1012 Freezing Mixtures

- Cryogen, for obtaining low temperatures by liquid carbon dioxide. *Cailletet*, —. Par. S. Ps. 84. (1891) 142-.
- Cryogenic laboratory, Leiden, work at. *Kamerlingh Onnes*, H. Amst. Ak. Vs. 3 (1895) 164-.
- and thermometric application of carbon dioxide snow. *Du Bois*, H., & *Wills*, A. P. D. Pa. Gs. Vh. (1899) 168-.
- Freezing by expansion of air. *Gilbert*, L. W. Gilbert A. 18 (1804) 412-.
- machines, new. *Pictet*, R. Arch. Sc. Ps. Nt. 13 (1885) 212-.
- , — arrangements. *Pictet*, R. Arch. Sc. Ps. Nt. 13 (1885) 397-.

## FREEZING MIXTURES.

- Rudorff*, F. A. Ps. C. 122 (1864) 337-.
- Berthelot*, M. C. R. 78 (1874) 1173-.
- formed by acid and hydrated salt. *Ditte*, A. C. R. 90 (1880) 1163-.
- — — — — *Berthelot*, M. C. R. 90 (1880) 1191-.
- — carbon dioxide and sulphur dioxide. *Pictet*, R. Arch. Sc. Ps. Nt. 14 (1885) 570-.
- — 2 crystallised salts. *Ditte*, A. C. R. 90 (1880) 1282-.
- — ice and salt. *Meidinger*, H. Halle Z. Nw. 40 (1872) 106-.
- — snow and alcohol. *Marchand*, R. F. Erdm. J. Pr. C. 25 (1842) 253-.
- — — sulphuric acid. *Pfaundler*, L. Wien Sb. 71 (1875) (Ab. 2) 509-.
- with solid carbon dioxide. *Cailletet*, L., & *Colardeau*, E. C. R. 106 (1888) 1631-.
- historical account. *Lippmann*, E. O. von. Z. Angew. C. (1898) 739-.
- strong artificial. *Marchand*, R. F. Erdm. J. Pr. C. 32 (1844) 499.
- theory. *Potier*, A. C. R. 101 (1885) 998.

- Freezing by rapid evaporation. *Leslie*, J. A. C. 78 (1811) 177-.
- — — (Leslie). *Clément*, —, & *Désormes*, —. A. C. 78 (1811) 183-.
- water-logged deposits, Gobert process. *Gobert*, A. Brux. S. Blg. Gl. Bll. (1897) (PV.) 65-.
- Hoar frost produced by capillarity and evaporation. *Decharme*, C. C. R. 86 (1878) 1004-.
- Ice and cold, artificial production. *Paul*, B. H. QJ. Sc. 6 (1869) 197-.
- machines. *Schmidt*, G., & *Zeuner*, G. Dingler 244 (1882) 89-.
- — *Corsepius*, —. Civing. 38 (1892) 435-.
- —, volatile liquids for. *Seely*, C. A. [1870] N. Y. Lyceum P. 1 (1870-71) 59-.
- Insulation of cold stores. *Brown*, F. D. [1897] N. Z. I. T. 30 (1898) 44-.
- Liquefied gases and low temperatures. *Dessau*, B. [1900] Ps. Z. 2 (1901) 20-, 37-, 60-.
- —, use as cooling materials. *Cailletet*, L. C. R. 94 (1882) 1224-; A. C. 29 (1883) 153-.

## Refrigeration 1013

- Liquefied gases, use as cooling materials. *Wroblewski*, S. von. Wien Ak. Sb. 91 (1885) (Ab. 2) 667-; Mh. C. (1885) 204-.
- marsh gas, use. *Cailletet*, L. C. R. 98 (1884) 1565-.
- — —, —. *Wroblewski*, S. C. R. 99 (1884) 136-.
- — —, —. *Cailletet*, L. Ph. Mg. 19 (1885) 65.
- Liquid air. *Dewar*, J. [1896] R. I. P. 15 (1899) 133-.
- — as analytical agent. *Dewar*, J. [1896] R. I. P. 15 (1899) 815-.
- — and its applications. *Belforti*, U. Rv. Sc.-Ind. 31 (1899) 65-.
- —, scientific uses. *Dewar*, J. [1894] R. I. P. 14 (1896) 393-.
- —, vacuum vessels. *Dewar*, J. [1893] R. I. P. 14 (1896) 1-.
- hydrogen, etc., temperatures obtainable by free evaporation. *Wroblewski*, S. C. R. 100 (1885) 979-.
- Mercury, congelation by ether. *Marcet*, A. Nicholson J. 34 (1813) 119-.
- Poetsch process (sinking shafts by previously freezing the ground). *Sacrier*, —. St. Ét. Bll. S. In. Mn. 11 (1897) 647-.
- — at the Vicq pit. *Sacrier*, —, & *Waymel*, —. St. Ét. Bll. S. In. Mn. 9 (1895) 27-.
- Rapid production. *Carmichael*, H. [1882] Am. As. P. 31 (1883) 223-.
- Refrigerating apparatus. *Linde*, C. S. C. In. J. 13 (1894) 502-.
- machines. *Planet*, E. de. Toul. Ac. Sc. Mm. 1 (1879) (Sem. 2) 246-.
- —. *Lightfoot*, T. B. I. ME. P. (1886) 201-.
- Refrigeration. *Bickerton*, A. W. [1881] N. Z. I. T. 14 (1882) 394-.
- of air, processes and applications. *Jougllet*, A. Mon. Sc. 15 (1873) 275-.
- , artificial. *Gamgee*, J. U. S. Fish Com. Rp. 5 (1879) 901-.
- and ice-making machines. *Selge*, N. N. S. W. R. S. J. 30 (1897) xxxii-.
- by liquids at low temperatures. *Schloesing*, T. C. R. 111 (1890) 85-.
- , mechanical, bibliography. *Bourne*, J. I. CE. P. 37 (1874) 271-.
- for preservation of foods. *Tolson*, J. [1886] Queensl. R. S. P. 3 (1887) 49-.
- Refrigerator. *Osann*, G. Würzb. Vh. 5 (1855) 410-.
- *Carré*, E. C. R. 64 (1867) 897-.
- for brewers' wort. *Davison*, R. (vi Add.) CE. I. P. 1 (1841) 57-.
- with volatile liquids not miscible at low temperatures. *Pictet*, R. C. R. 100 (1885) 329-.
- Temperature of water in freezing mixture. *Gough*, J. Nicholson J. 13 (1806) 189-.
- Temperatures under -100°, production and effects. *Pictet*, R. Cztg. Opt. 12 (1891) 275-.
- Water, artificial freezing. *Decourdemanche*, —. J. Phm. 11 (1825) 584-.
- , freezing by ether. *Hare*, R. Sturgeon A. Electr. 5 (1840) 151-.
- —, new method. *Leslie*, J. Thomson A. Ph. 9 (1817) 412-; *Tilloch* Ph. Mg. 51 (1818) 411-.

## 1014 Methods of Producing Constant Temperatures. Thermostats 1014

- Water, freezing by sulphuric acid. *Hare, R.* Philad. Coll. Phm. J. 6 (1835) 91-.
- , — — — and ether. *Hare, R.* [1838-40] *Sturgeon A. Electr.* 2 (1838) 400-; *Am. Ph. S. T.* 7 (1841) 215-.
- ### 1014 Methods of Producing Constant Temperatures. Thermostats.
- Foerster, W.* Par. Poids et Mes. PV. (\*1875-76) 128-; (\*1877) 245-.
- Crew, H.* Ph. Mg. 33 (1892) 89-.
- Gouy, —.* C. R. 117 (1893) 96-.
- Apparatus. *Merryweather, G.* Edinb. N. Ph. J. 14 (1833) 360-.
- , *Kohlrausch, F. A.* Ps. C. 125 (1865) 626-.
- , *Cady, H. P.* J. Ps. C. 2 (1898) 242-.
- (calorifères à feu continu). *Pelet, L.* Laus. S. Vd. Bll. 34 (1898) 243-.
- for maintaining constant temperature above 100°. *Ulach, K.* Z. Vr. Rübenzuckin. 40 (1890) 1039-.
- — obtaining constant temperature water current. *Pulfrich, C.* Z. Instk. 18 (1898) 49-.
- Automatic maintenance of constant temperature in chamber. *Arsonval, A. d'.* C. R. 107 (1888) 194-; Par. S. Bl. Mm. 40 (1888) (C. R.) 530-.
- regulation. *Čebyšev, (Lt.-Gen.) V. L.* Rs. Ps.-C. S. J. 28 (Ps.) (1896) 56-.
- — and registration. *Parenty, H., & Bricard, R.* C. R. 122 (1896) 919-.
- Constant high temperatures in metallic vapour baths. *Barus, C., & Hallock, W.* U. S. Gl. Sv. Bll. No. 54 (1889) 58-.
- temperature from 100° to 700°. *Bodenstein, M.* Z. Ps. C. 30 (1899) 113-.
- —, d'Arsonval's method of maintaining. *Neesen, F.* [1882-83] (XII) Berl. Ps. Gs. Vh. 1 (1882) 39-; 2 (1884) 29-.
- — in buildings. *Wild, H.* [1885] St. Pét. Ac. Sc. Bll. 30 (1886) 363-.
- — and pressure, maintenance. *Brown, F. D.* [1879] L. Ps. S. P. 3 (1880) 68-; Ph. Mg. 7 (1879) 411-.
- Heat regulation, thermoelectric. *Regaud, C., & Fouilliand, R.* J. Pl. Pth. Gén. 2 (1900) 457-.
- Hot blast, equalisation of varying temperatures. *Gjers, L. F., & Harrison, J. H.* I. & S. I. J. (1900) (No. 1) 154-.
- Incubator with electromagnetic arrangement for constant temperature. *Landois, C. C. A. L.* N.-Vorp. Mt. 12 (1880) 81-.
- Oil bath, convenient form. *Evans, W. P.* [1897] N. Z. I. T. 30 (1898) 495-.
- Regulation of temperature. *Prytz, K.* Kjøb. Ov. (1892) 142-; Föchr. Ps. (1892) (Ab. 2) 249.
- Regulator (Sir J. Hall's). *Hall, B.* [1833] Gl. S. P. 1 (1834) 478-.
- , *Benoit, R.* Par. S. Ps. 86. (1879) 6-.
- , *Arsonval, A. d'.* C. B. 92 (1881) 76-.
- , *Dupetit, —.* [1884] Bordeaux S. Sc. Mm. 2 (1886) xxvii-.
- Regulator. *Soret, C.* [1884] Arch. Sc. Ps. Nt. 13 (1885) 70-.
- , *Darwin, H.* Nt. 33 (1886) 596-.
- , electrical. *Grassini, R.* Rv. Sc.-Ind. 32 (1900) 27-.
- , gas. *Schwald, E.* Z. Ws. Mkr. 5 (1888) 331-.
- , —, *Weiss, G.* Par. S. Bl. Mm. 49 (1897) (C. R.) 88.
- , —, and thermostat for incubators. *Heydenreich, L.* Z. Ws. Mkr. 9 (1892) 299-.
- , metastatic. *Randolph, N. A.* Franklin I. J. 118 (1884) 178-.
- , new. *Novy, F. G.* Mor. S. J. (1898) 478-.
- , selenium photo-electric. *Germain, P.* C. R. 91 (1880) 688-.
- and thermograph. *Baumhauer, E. H. von.* Arch. Néerl. 19 (1884) 297-.
- for warming by steam. *Fischer, Herm.* Dingler 234 (1879) 161-.
- of wide range. *Gumlich, E.* Z. Instk. 18 (1898) 317-.
- Regulators. *Brown, J. T.* Nt. 26 (1882) 114-.
- , *Bierliet, — van.* Brux. S. Sc. A. 12 (1888) (Pt. 1) 75-.
- , *Riehrbeck, H.* D. Nf. Tbl. (1889) 721-.
- ### THERMOSTATS.
- Ure, Andr.* R. S. P. 3 (1831) 67.
- Guthrie, Fred.* Ph. Mg. 36 (1868) 30-.
- (Hipp's.) *Hirsch, A.* Carl Rpm. 4 (1868) 200-.
- Laspeyres, E. A. H.* A. Ps. C. 152 (1874) 132-.
- Baur, C.* Berl. Ps. Gs. Vh. (1886) 44-.
- Pernet, J.* Berl. Ps. Gs. Vh. (1886) 55-.
- Arsonval, A. d'.* C. R. 107 (1888) 194-; Par. S. Bl. Mm. 40 (1888) (C. R.) 530-.
- (d'Arsonval's.) *Rohrbeck, H.* D. Nf. Tbl. (1888) 1.
- Michel, A.* Par. S. Bl. Mm. 44 (1892) (C. R.) 932-.
- electric. *Dumoncel, T.* [A. L.] C. R. 88 (1854) 1027-.
- , *Kurčinskij, V. P.* [1891-98] Kiev S. Nt. Mm. 12 (2) (1892) xlvii-; Föchr. Ps. (1893) (Ab. 2) 272-.
- , *Whitney, W. R.* Am. As. P. (1897) 127.
- , *Duane, W., & Lory, C. A.* Am. J. Sc. 9 (1900) 179-.
- , for bacteriological incubator. *Hanfland, F.* Z. Ws. Mkr. 17 (1900) 440-.
- with electric heating to 500°. *Rothe, R.* Z. Instk. 19 (1899) 143-.
- — regulator. *Gouy, —.* J. de Ps. 6 (1897) 479-.
- existing forms. *Hammerl, H.* Carl Rpm. 18 (1882) 309-, 385-, 441-.
- gas. *Edwards, A. M.* A. C. 25 (1872) 890-.
- without gas. *Karawaiew, W.* Z. Ws. Mkr. 13 (1896) 172-.
- —, modification. *Karawaiew, W.* Z. Ws. Mkr. 13 (1896) 289-.
- gas pressure regulator for. *Knudsen, L.* [1884] Kjøb. Carlsb. Lb. Mdd. 2 (1888) 134- (Réf. 78-).

## 1200 Thermometry

- gas pressure regulator for. *Murrill, R. Mor. S. J.* (1898) 490-.
- improvement. *Blümcke, A. A. Ps. C. 25* (1885) 419-.
- *Golicyn, (Prince) B. B. St. Pét. Ac. Sc. Bll. 7* (1897) xv-.
- for incubation and artificial digestion experiments. *Randolph, N. A. Franklin I. J. 86* (1888) 465-.
- — — microscope work. *Koch, A. Z. Ws. Mkr. 10* (1893) 161-.
- self-regulating (without gas or electricity). *Landois, L. N.-Vorp. Mt. 24* (1892) 30-.
- simple. *Reichert, E. A. Ps. C. 144* (1872) 467-.
- and sensitive. *Andrae, G. [J.] L. (xii) Mbl. Nt. 8* (1878) 98-; (ix) *A. Ps. C. 4* (1878) 614-.
- , working by gas pressure. *Baumhauer, E. H. von. C. R. 99* (1884) 370-.
- for temperatures between 50° and 300°. *Mahike, A. Z. Instk. 13* (1893) 197-.

## THERMOMETRY.

### 1200 General.

- Cotte, L. J. de Ps. 68* (1809) 132-, 222-.
- Egen, P. N. C. Pogg. A. 11* (1827) 276-, 335-, 517-; 13 (1828) 33-.
- Pernet, J. Carl Bpm. 11* (1875) 257-.
- Mills, E. J. Ph. Mg. 6* (1878) 62-.
- Crafts, J. M. C. R. 91* (1880) 574-.
- Mills, E. J. Edinb. R. S. T. 29* (1880) 567-; *Ph. Mg. 12* (1881) 142-.
- Brown, F. D. L. Ps. S. P. 5* (1884) 116-; *Ph. Mg. 14* (1882) 57-.
- Gerland, E. Kassel Vr. Nt. Festschr. (1886) 62-*.
- Walter, B. Z. Instk. 12* (1892) 342-.
- Busmann, —. [1897] Westf. Vr. Jbr. (1897-98) 143-*.
- Cole, A. S., & Durgan, E. L. Ps. Rv. 4* (1897) 217-.
- Chree, C. Nt. 58* (1898) 304-; *Ph. Mg. 45* (1898) 205-, 299-.
- Aneroid-thermoscope, lecture demonstration apparatus. *Karsten, G. [1889] Schl.-Holst. Nt. Vr. Schr. 8* (1891) 17-.
- Barometer, formula for use as thermometer. *Villeneuve, — (comte) de. Fr. Cg. Sc. 33* (1866) 339-.
- Capillary corrections to pressure and temperature measurements. *Pernet, J. Z. Instk. 6* (1886) 377-.
- Glass, change in properties. *Weber, R. Par. Bll. S. C. 1* (1864) 305-.
- , "Jena normal." *Wiebe, H. F. Z. Instk. 6* (1886) 187-.
- , permeability by gases. *Bartoli, A. Rm. R. Ac. Linc. T. 8* (1884) 337-.
- , physical properties. *Schott, O. Z. Instk. 11* (1891) 330-.
- Heat, fundamental laws, and true measure of temperature. *Schitko, J. Baumgartner Z. 4* (1828) 436-; 6 (1829) 138-.

## Measurement of Temperature 1200

- Heat, measurement, new method. *Müller-Ersbach, —. Cztg. Opt. 10* (1889) 14-.
- High temperatures. *Saint-Edme, E. Cosmos 22* (1863) 754-.
- — —, experiments. *Pouillet, C. S. M. C. R. 3* (1836) 782-; *Pogg. A. 39* (1836) 544-, 567-.
- — — and vaporisation of carbon. *Berthelot, —. C. R. 115* (1892) 1275-.

## MEASUREMENT OF TEMPERATURE.

- Pollet, —. Amiens Mm. Ac. (1848) 39-*.
- Fiévet, E. Cuyper Rv. Un. 19* (1866) 306-.
- Boscha, J. Les Mondes 21* (1869) 720-, 761-.
- Recknagel, G. A. Ps. C. Ergänz. 6* (1874) 275-.
- Dragoumis, E. J. Berl. B. 10* (1877) 1648-.
- Callendar, H. L. [1886] Phil. Trans. (A) 178* (1888) 161-.
- Weber, C. L. Cztg. Opt. 11* (1890) 88-, 111-.
- Accuracy. *Renou, E. C. R. 109* (1889) 895-.
- *Guillaume, C. É. C. R. 109* (1889) 963-.
- Air temperature. *Dufour, C. Arch. Sc. Ps. Nt. 4* (1897) 344-.
- Atmosphere in sunshine. *Aymonnet, —. C. R. 87* (1878) 23-.
- Cyclically varying temperature. *Burstell, H. F. W. L. Ps. S. P. 13* (1895) 579-; *Ph. Mg. 40* (1895) 282-.
- Flame of water-gas. *Blass, E. [1892] Nt. 47* (1892-93) 113.
- — — (Blass). *Kurnakow, N. Ftschr. Ps. (1893) (Ab. 2) 309*.
- High and solar temperatures. *Sainte-Claire Deville, H. C. R. 74* (1872) 145-.
- — — *Callendar, H. L. [1899] R. I. P. 16* (1902) 97-.
- temperatures. *Biot, J. B. J. Mines 17* (1804) 203-.
- *Prinsep, J. [1827] Phil. Trans. (1828) 79-*.
- *Pouillet, C. S. M. Froriep Not. 24* (1829) 39-.
- *Erman, A., & Herter, P. Pogg. A. 97* (1856) 489-.
- *Sainte-Claire Deville, H., & Troost, L. C. R. 56* (1863) 977-.
- *Becquerel, E. C. R. 57* (1863) 855-.
- (Becquerel). *Sainte-Claire Deville, H. C. R. 57* (1863) 894-.
- *Becquerel, E. C. R. 57* (1863) 925-.
- *Berthelot, M. Par. Bll. S. C. 8* (1867) 387-; *A. C. 13* (1868) 144-.
- *Fischer, F. Dingler 230* (1878) 319-.
- *Sainte-Claire Deville, É. H., & Troost, L. C. R. 90* (1880) 727-, 773-.
- *Selivanov, T. Rs. Ps.-C. S. J. 23* (Ps.) (1891) 152-; *J. de Ps. 1* (1892) 134-.
- *Barus, C. Ph. Mg. 34* (1892) 1-.
- *Le Chatelier, H. Rv. So. 49* (1892) 162-.
- *Roberts-Austen, W. C. I. CE. P. 110* (1892) 152-.
- *Berghaus, A. Cztg. Opt. 14* (1893) 121-.

## 1200 Thermometers

- High temperatures. *Deny, É.* Mulhouse S. In. Bll. 64 (1894) 359-.
- —. *Béguin, L.* Gén. Civ. 28 (1895-96) 388-.
- —. *Boudouard, —.* Z. Angew. C. (1900) 794.
- —. *Grünhut, —.* [1900] Nass. Vr. Jb. 54 (1901) xl-.
- Liquids, correction for, in case of insufficient immersion. *Ferrini, R.* Mil. I. Lomb. Rd. 8 (1875) 141-.
- and solids. *Botelho de Lacerda, C.* Lisb. Mm. Ac. Sc. 5 (1818) (pte. 2) 28-.
- Low temperatures. *Pouillet, C. S. M. C. R.* 4 (1837) 513-.
- —. *Cailletet, L., & Colardeau, E. C. R.* 106 (1888) 1489-; Par. S. Ps. Sé. (1888) 295-.
- —. *Guillaume, C. É.* Arch. Sc. Ps. Nt. 20 (1888) 396-.
- —. *Holborn, L., & Wien, W. A. Ps. C.* 59 (1896) 213-; Berl. Ak. Sb. (1896) 673-.
- —. *Kamerlingh Onnes, H.* Amst. Ak. Vs. 5 (1897) 37-, 79-; J. de Ps. 9 (1900) 128.
- —. *Kamerlingh Onnes, H., & Boudin, M.* [1900] Amst. Ak. Vs. 9 (1901) 224-, 308; Amst. Ak. P. 3 (1901) 299-, 374.
- Solid homogeneous body. *Betti, E.* Mod. Mm. S. It. 1 (pte. 2) (1868) 165-.
- Sources of error. *Schütt, —.* Z. Angew. C. (1897) 96-.
- Temperature determination in a given time, of variable source of heat. *Indra, A.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 823-.
- and time, measurement, analogy between. *Macgregor, J. G.* [1887] N. Scotia I. Sc. P. & T. 7 (1890) 20-.

### Thermometers.

- Schultes, J. A.* Gehler J. 5 (1908) 729-.
- Bellani, A.* Poligrafo 9 (1832) 169-.
- Dobrzyński, F.* Kosmos (Lw.) 9 (1884) 712.
- Müller-Uri, R.* Braunsch. Vr. Nt. Jbr. (10) (1897) 35-.
- behaviour in vacuum. *Loewy, B. R. S. P.* 17 (1869) 319-.
- centigrade, fixing boiling point. *Abbadie, A. T. d'. C. R.* 40 (1855) 847-.
- — —. *Melander, G.* Helsingf. Öfv. 33 (1891) 230-.
- , general use. *Uhde, A. D. Nf. Vsm. B.* (1841) 151-.
- construction. *Peñalver, J. L. de.* Madrid A. H. Nt. 2 (1800) 143-.
- —. *Landriani, M.* Brugatelli G. 2 (1819) 292-.
- —. *Rudberg, F.* Stockh. Ak. Hndl. (1834) 354-; Pogg. A. 37 (1836) 376-; 40 (1837) 39-, 562-.
- and definition of temperature. *Potter, R. Ph. Mg.* 24 (1862) 447-.
- Deluc's. *Legrand, —.* C. R. 71 (1870) 66.
- general arrangement. *Markiewicz, R.* Krk. Roczn. Uniwers. 1 (1817) 123-.
- improved. *Rutherford, D.* [1790] Edinb. R. S. T. 3 (1794) 247-.

## Thermometers 1200

- improvements. *Babbini, G.* Firenze A. Ms. Imp. 2 (1810) (pte. 2) 1-.
- index-. *Giovambatista da S. Martino.* Verona Mm. S. It. 6 (1792) 71-.
- for low temperatures. *Chappuis, P.* Arch. Sc. Ps. Nt. 28 (1892) 293-.
- new. *Lamy, A. C. R.* 70 (1870) 893-.
- , or cryometer. *Pleischl, A.* Pogg. A. 63 (1844) 115-.
- , very sensitive. *Michelson, A. A.* Par. S. Ps. Sé. (1882) 66-.
- non-equilibrated, rate of change of readings. *Dufour, C.* Laus. S. Vd. Bll. 33 (1897) 125-.
- precautions in use. *Gobin, A. (x)* Lyon S. Ag. A. 6 (1873) xvi-.
- precision. *Pierre, J. I.* Fr. An. Mét. (1849) 190-.
- sensibility. *Thomsen, J.* Kjöb. Ov. (1868) 25-.
- —. *Guillaume, C. É.* Par. S. Ps. Sé. (1891) 6-.
- —. *Auzenat, R.* Mon. Sc. 14 (1900) 753-.
- in liquids. *Hartmann, J.* Z. Instk. 17 (1897) 131-.
- and temperature. *Witkowski, A. W. (xii)* Kosmos (Lw.) 8 (1883) 269-, 493-.
- theory. *Handl, A.* Carl Rpm. 17 (1881) 300-.
- tubes, graphical calibration. *Majorana, Q.* Rm. R. Ac. Linc. Rd. 4 (1895) (Sem. 2) 97-.
- verification. *Forbes, J. D.* Phil. Trans. (1836) 571-.
- 
- Pyrometer (new). *Daniell, J. F.* QJ. Sc. 11 (1821) 309-.
- (—). *Neumann, A.* Baumgartner Z. 10 (1832) 284-.
- (—). *Lamy, A. C. R.* 69 (1869) 347-.
- Pyrometric experiments. *Hassler, F. R.* [1817] Am. Ph. S. T. 1 (1818) 210-.
- — (Hassler). *Patterson, R.* Am. Ph. S. T. 1 (1818) 227.
- Pyrometry. *Becquerel, E. (vii)* Par. A. Cons. 4 (1863) 597-.
- Temperature and absolute zero. *Bauer, K. L.* A. Ps. C. 153 (1874) 133-.
- , certain effects. *Coathupe, C. T.* Ph. Mg. 17 (1840) 130-.
- constants. *Šubic, S.* A. Ps. C. 147 (1872) 452-.
- , equilibrium. *Laurent, P. A.* Par. Éc. Pol. J. 40<sup>e</sup> cah. (1863) 75-.
- of medium, calculation. *Volpicelli, P. C.* R. 60 (1865) 416-; Rm. At. N. Linc. 18 (1865) 233-.
- reached in converters, etc. *Le Chatelier, H.* C. R. 114 (1892) 470-.
- scale on gas thermometer, and molecular weights. *Berthelot, —.* Rv. Sc. 33 (1884) 513-.
- Thermometric admeasurement and capacity. *Ure, Andr.* Phil. Trans. (1818) 338-.
- Thermometry of the Accademia del Cimento (Florence). *Moritz, A.* [1849] St. Pét. Ac. Sc. Bll. 3 (1850) 19-.



- Thermometry and allied subjects. *Geissler*, —, & *Plücker*, —. *Pogg. A.* 86 (1852) 238-.
- — plethysmometry, relations between. *Christiani, A., & Kronecker, H.* *Arch. An. Pl. (Pl. Ab.)* (1878) 336-.
- , theorem. *Hartmann, J.* *Z. Instk.* 17 (1897) 14-; *Met. Z.* 14 (1897) 45-.
- Transformation of thermal coefficients. *Guillaume, C. É.* *Par. Poids et Mes. Tr. Mm.* 6 (1888) 25 pp.; *Arch. Sc. Ps. Nt.* 22 (1889) 5-.
- Transmission apparatus for thermometric readings. *Moennich, P.* *Exner Rpm.* 24 (1888) 696-.

### 1210 Expansion and Pressure Thermometry.

- Barometric temperature measurement. *Toepler, A.* *Dresden Isis Sb.* (1894) 33-; *A. Ps. C.* 56 (1895) 609-; 57 (1896) 324-.
- Coefficients of expansion of gases and their suitability for use in thermometry. *Crafts, J. M.* *C. R.* 98 (1884) 1259-.
- Differential thermometer, use. *Meyer, O. E.* *Bresl. Schl. Gs. Jbr.* (1897) (*Ab. 2a*) 25.
- Expansion of glass, influence on readings. *Fischer, E. G.* *Berl. Ab.* (1816-17) (*Ps.*) 80-.
- Expansions of air and mercury as given by *Regnault*. *Matthiessen, L.* *Z. Mth. Ps.* 18 (1873) 323-.
- Exposed column correction. *Rimbach, E.* *Berl. B.* 22 (1889) 3072-; *Z. Instk.* 10 (1890) 153-, 292-.
- — —, *Guillaume, C. É.* *C. R.* 112 (1891) 87-; *Par. S. Ps. Sé.* (1891) 17-; *Par. S. C. Bll.* 5 (1891) 547-.
- — —, *Renou*, —. *C. R.* 112 (1891) 260.
- — —, auxiliary tube for. *Mahlke, A.* *Z. Instk.* 13 (1893) 58-.
- — —, — — —, *Guillaume, C. É.* *Z. Instk.* 13 (1893) 155-.
- Fixed points, determination. *Pernet, J., Jaeger, W., & Gumlich, E.* *Berl. Ps. Reichsanst. Ab.* 1 (1894) 81-.
- — —, variation. *Crafts, J. M.* *C. R.* 91 (1880) 370-.
- Freezing of water on thermometers. *Henrici, F. C.* *Pogg. A.* 47 (1839) 214-.
- — — (Henrici). *Gintl, W.* *Baumgartner Z.* 6 (1840) 153-.
- Furnace, temperature, determination. *Musset, D.* *Tilloch Ph. Mg.* 4 (1799) 255-.
- Gas-thermometry. *Chappuis, P.* *L. Ps. S. P.* 17 (1901) 355-; *Ph. Mg.* 50 (1900) 433-.
- Ibañez method. *Maurer, J.* *Zür. Vjschr.* 29 (1884) 139-; *Z. Instk.* 4 (1884) 269-.
- Irregular indications in thermometers. *Hera-path, J.* *Tilloch Ph. Mg.* 63 (1824) 8-.
- Kew apparatus for verification of thermometers. *Galton, F.* [1877] *R. S. P.* 26 (1878) 84-.
- Mercurial thermometry, absolute. *Sworn, S. A.* [1899] *R. S. P.* 66 (1900) 86-.
- Pressure coefficient. *Guillaume*, —. *Par. S. Ps. Sé.* (1890) 158.
- Pressure coefficients. *Chree, C.* *Ph. Mg.* 38 (1894) 371-.
- — —, *Pernet, J., Jaeger, W., & Gumlich, E.* *Berl. Ps. Reichsanst. Ab.* 1 (1894) 87-.
- — —, and elasticity of glass. *Reggiani, N.* *Rm. B. Ac. Linc. Rd.* 1 (1892) (*Sem. 1*) 298-.
- — —, correction. *Venable, F. P., & Gore, J. W.* *Science* 7 (1886) 144-, 190.
- — —, *Sig. Science* 7 (1886) 168.
- — —, influence. *Delarive, A., & Marcet, F.* *Bb. Un.* 22 (1823) 265-.
- — —, *Zantedeschi, F.* *Ven. Aten. Esercit.* 6 (1848) 273-.
- — —, *Vicentini, G.* (*xii*) *Rv. Sc.-Ind.* 15 (1883) 178-.
- — —, *Pickering, S. U. L.* *Ps. S. P.* 8 (1887) 234-; *Ph. Mg.* 23 (1887) 406-.
- — —, on vacuous thermometers. *Gintl, W.* *Baumgartner Z.* 5 (1837) 8-.
- — —, internal. *Guillaume, C. É.* *C. R.* 108 (1886) 1183-.
- Pyrometer, air-, and dasymeter of *Siebert* and *Dürr*. *H. Oestr. Z. Brgw.* 41 (1893) 291.
- — —, — — —, manometer. *Codazza, G.* *Tor. At. Ac. Sc.* 8 (1872-73) 351-.
- — —, new. *Wiborgh, J.* *Jern-Kont. A.* 43 (1888) 97-; *I. & S. I. J.* (1888) (*No. 2*) 110-.
- — —, *Jüptner, H. von.* *Oestr. Z. Brgw.* 42 (1894) 409-.
- — —, *Wiborgh's.* *Sprung, A.* *Oestr. Z. Brgw.* 37 (1889) 20-.
- — —, *Jüptner, H. von.* *Oestr. Z. Brgw.* 38 (1890) 397-.
- — —, *Crum, J.* [1891] *Glasg. I. Eng. T.* 35 (1892) 123-.
- — —, *Trotz, E.* [1892] *Am. I. Mn. E. T.* 21 (1893) 592-.
- — —, improvement. *Wiborgh, J.* *Jern-Kont. A.* 46 (1891) 81-; *I. & S. I. J.* (1891) (*No. 2*) 130-.
- — —, new. *Schw. Humb.* 3 (1884) 382-.
- — —, platinum. *Guyton de Morveau, L. B. A. C.* 46 (1803) 276-.
- — —, and thermometer. *Fischer, F.* *Dingler* 225 (1877) 272-, 463-.
- Pyrometry. *Guyton de Morveau, L. B.* *Par. Mm. de l'I.* (1808) (*Sem. 2*) 1-; (1811) 89-.
- — —, recent advances. *Roberts-Austen, W. C.* [1893-94] *Am. I. Mn. E. T.* 23 (1894) 407-; 24 (1895) 798-.
- Quartz, fused, use in thermometers, etc. *Gautier, A.* *C. R.* 130 (1900) 816.
- Range 100° to 300°. *Sherman, O. T.* *Am. J. Sc.* 30 (1885) 42-.
- Silica, fused, resistance to fracture under sudden change of temperature. *Dufour*, —. *C. R.* 130 (1900) 1753-.
- — —, use in thermometry. *Shenstone, W. A.* *Nt.* 61 (1899-1900) 540.

### THERMOMETERS.

- Littrow, J. J. von.* *Gehlen J.* 7 (1808) 387-.
- Carl, P.* *Carl Rpm.* 2 (1867) 249-.
- Rogers, W. A., & Woodward, R. S.* *Am. As. P.* (1869) 134-.
- air. *Gay-Lussac, L. J. A. C.* 51 (1832) 435-.

## 1210 Thermometers

- air. *Jolly, P. von.* A. Ps. C. Jubelbd. (1874) 82-.
- , *Winstanley, D. L.* Ps. S. P. 4 (1881) 67-; Ph. Mg. 10 (1890) 380-.
- , *Pettersson, O.* J. Pr. C. 25 (1882) 102-.
- , *Mazzotto, D.* N. Cim. 29 (1891) 142-.
- , and air barometer. *Steinhäuser, A.* Exner Rpm. 23 (1887) 411-.
- , with barometer. *Müller, F. C. G.* A. Ps. C. 36 (1889) 763-.
- , calibration of bulb. *Cady, W. G.* Am. J. Sc. 2 (1896) 341-.
- , calorimetry with. *Lacínov, D. A.* Ra. Ps.-C. S. J. 16 (Ps.) (1884) 292-.
- , compensated. *Callendar, H. L.* R. S. P. 50 (1892) 247-.
- , constant volume. *Bottomley, J. T.* Edinb. R. S. P. 15 (1889) 85-.
- , —. *Murray, J. R. E.* Edinb. R. S. P. 21 (1897) 299-.
- , discussion of properties. *Potter, R.* Ph. Mg. 24 (1862) 263-.
- , for high temperatures. *Schneebeli, H.* Arch. Sc. Ps. Nt. 8 (1882) 244-; 9 (1883) 355-.
- , —. *Wiborgh, J. G.* Cztg. Opt. 11 (1890) 14-.
- , at high temperatures. *Holborn, L., & Day, A. L.* Am. J. Sc. 8 (1899) 165-; 10 (1900) 171-.
- , improvements. *Soret, C., & Le Royer, A.* Arch. Sc. Ps. Nt. 22 (1889) 270-.
- , indications of which are independent of barometric pressure. *Michelson, A. A.* Am. J. Sc. 24 (1882) 92.
- , with metal bulbs, anomalies. *Fuess, R.* Z. Instk. 5 (1885) 274-.
- , —. *Knopf, O.* Z. Instk. 5 (1885) 432-.
- , new form. *Cantzlaar, J.* [1816] Zeew. Gn. N. Vh. 2 (1818) 17 pp.
- , —. *Grimshaw, W.* Ir. Ac. P. 1 (1841) 405-.
- , —. *Holten, C.* Sk. Nf. F. 3 (1842) 315-.
- , —. *Tate, T.* Ph. Mg. 20 (1860) 298-.
- , —. *Cooke, J. P.* Am. J. Sc. 15 (1878) 391-.
- , —. *Crafts, J. M.* A. C. 14 (1878) 409-.
- , —. *Witz, A.* C. R. 91 (1880) 164-.
- , self-correcting. *Müller, F. C. G.* Cztg. Opt. 17 (1896) 14-.
- , with platinum bulb, and invariable zero. *Marchis, —.* Par. S. Ps. Sé. (1895) 56-.
- , reduction of dead space. *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 2) 292-.
- , for temperatures above 300° C. *Joannis, —.* Bordeaux S. Sc. Mm. 4 (1888) xxxv-.
- , theory. *Meikle, H.* Edinb. N. Ph. J. 1 (1826) 332-.
- , use. *Knochenhauer, K. W.* [1860-61] Wien SB. 43 (Ab. 2) (1861) 27-; 44 (Ab. 2) (1862) 259-; 45 (Ab. 2) (1862) 229-.
- alcohol. *Flaugergues, H.* J. de Ps. 66 (1808) 295-; 67 (1808) 123-.
- , *Hicks, J. J.* [1874] Met. S. QJ. 2 (1875) 96-.

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- alcohol, graduation. *Angot, A.* J. de Ps. 10 (1891) 399-.
- , hydrogen, and toluene, at low temperatures. *Chappuis, —.* Par. Poids et Mes. PV. (1891) 45-.
- and toluene for, comparison. *Benoit, —.* Par. Poids et Mes. PV. (1890) 10-.
- Challenger, pressure errors.* *Tait, P. G.* [1881] Nt. 25 (1882) 90-, 127-.
- compensation (Schott's). *Hoffmann, W.* Z. Instk. 17 (1897) 257-.
- , *Müller, G.* Z. Angew. C. (1898) 29.
- construction. *Pernet, J., Jaeger, W., & Gumlich, E.* Berl. Ps. Reichsanst. Ab. 1 (1894) 12-.
- , theory. *Adams, (Rev.) J.* Silliman J. 8 (1824) 121-.
- correction. *Bessel, F. W.* Pogg. A. 6 (1826) 287-.
- delicate, calorimetric. *Pickering, S. U.* L. Ps. S. P. 8 (1887) 8-; Ph. Mg. 21 (1886) 330-; L. Ps. S. P. 8 (1887) 229-; Ph. Mg. 23 (1887) 401-.
- , short. *Raikow, P. N.* C. Ztg. 19 (1895) 1788.
- gas. *Coleman, J. J.* Glasg. Ph. S. P. 16 (1885) 220-.
- , *Chappuis, P.* Arch. Sc. Ps. Nt. 20 (1888) 5-, 153-, 248-.
- , *Le Royer, A., & Soret, C.* Arch. Sc. Ps. Nt. 20 (1888) 584-.
- , comparison at low temperatures. *Olzewski, K.* Krk. Ak. (Mt.-Prz.) Rz. 14 (1886) 283-; Fshr. Ps. (1886) (Ab. 2) 278.
- , constant pressure. *Thomson, (Sir) W.* Edinb. R. S. P. 10 (1880) 539-.
- , — volume. *Foster, G. C.* B. A. Rp. (1897) 210-.
- , at high temperatures. *Holborn, L., & Day, A. L.* Am. J. Sc. 8 (1899) 165-; 10 (1900) 171-.
- , independent of atmospheric pressure. *Cailletet, L.* C. R. 106 (1888) 1055-.
- , as pyrometer for high temperatures. *Regnault, V.* A. C. 63 (1861) 39-.
- , very sensitive. *Grassi, G.* Nap. Rd. 24 (1885) 16-, 131-.
- , use. *Crafts, J. M.* C. R. 106 (1888) 1222-.
- historical account. *Smolik, A.* Živa 8 (1860) 134-.
- , *Wohlwill, E.* [1864] A. Ps. C. 124 (1865) 163-.
- , *Burckhardt, F.* A. Ps. C. 133 (1868) 680-.
- hydrogen, limit of range. *Wroblewski, S. C.* R. 100 (1885) 979-.
- Joule's. *Schuster, A.* Nt. 47 (1892-93) 364.
- , *Young, S.* Nt. 47 (1892-93) 389-.
- , zero-point. *Young, S.* Nt. 47 (1892-93) 317.
- Kew standard. *Waldo, L.* Nt. 24 (1881) 100-.
- , errors. *Waldo, L.* Am. J. Sc. 21 (1881) 57-, 226-, 443-.
- 2 liquids for. *Lupin, — von.* Nt. 48 (1893) 206.

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medical, errors. *Ferenczy, M.* Cztg. Opt. 18 (1892) 117-.

mercury. *Henrici, F. C.* Pogg. A. 50 (1840) 251-.

—, *Guillaume, C. É.* Arch. Sc. Ps. Nt. 16 (1886) 507-; 17 (1887) 19-.

—, accuracy. *Crafts, J. M.* C. B. 95 (1882) 910-.

—, accurate. *Platania, G.* Catania Ac. Gioen. At. 6 (1898) Mem. 2, 4 pp.

—, calibration. *Brit. Ass. Comm.* B. A. Rp. (1882) 145-.

—, changes. *Blackadder, H. H.* Edinb. J. Sc. 5 (1826) 47-.

—, construction. *Heinrich, P.* Schweigger J. 1 (1811) 214-.

—, determination of fixed points. *Neubert, —.* Dresden Isis Sb. (1880) 29-.

—, —, —, and measurement of temperature. *Pernet, J.* Wien Met. Z. 14 (1879) 130-; Par. S. Ps. Sé. (1881) 136-.

—, —, —, volume of mercury. *Clark, J. W.* L. Ps. S. P. 7 (1886) 113-; Ph. Mg. 20 (1885) 48-.

—, —, —, — (Clark). *Clayden, A. W.* L. Ps. S. P. 7 (1886) 387-; Ph. Mg. 21 (1886) 248-.

—, —, —, weight of mercury. *Gerosa, G.* Rv. Sc.-Ind. 18 (1886) 326-.

—, electric reading at a distance. *Eschenhagen, M.* Z. Instk. 14 (1894) 398-.

—, eliminating variations of fixed points. *Pernet, J.* C. R. 91 (1880) 471-.

—, —, —, —, with tables. *Pernet, J.* Par. Poids et Mes. Tr. Mm. 1 (\*1881) B. 1-, B. 1-.

—, after heating. *Wiebe, H. F.* Z. Instk. 8 (1888) 373-.

—, high range, use of liquid carbon dioxide to produce pressure in. *Mahlke, A.* Z. Instk. 12 (1892) 402-.

—, at high temperatures. *Wiebe, H. F.* Z. Instk. 10 (1890) 207-.

—, influence of glass on readings. *Pernet, J., Jaeger, W., & Gumlich, E.* Berl. Ps. Reichsanst. Ab. 1 (1894) 5-.

—, insensitive. *Govi, G.* Nap. Bd. 21 (1882) 162-.

—, life history. *Sworn, S. A.* B. A. Rp. (1896) 729.

—, new form. *Pernet, J.* Berl. Ps. Gs. Vh. (1887) 37-.

—, oldest. *Hellmann, G.* Met. Z. 14 (1897) 31-.

—, reduction formula. *August, E. F.* Pogg. A. 13 (1828) 119-.

—, separation of column. *Gromadzki, A.* Mosc. Obs. A. 3 (Pt. 2) (\*1877) 135-.

—, use. *Dwars, B. W.* (xii) Mbl. Nt. 9 (1879) 78-.

—, —. *Crafts, J. M.* [1883] Am. C. J. 5 (\*1883-84) 307-.

metallic. *Jürgensen, U.* Kiøb. Dn. Vd. Selsk. Afh. 2 (1826) 281-.

—, *Jüllig, M.* Wien Ak. Sb. 79 (1879) (Ab. 2) 349-.

—, *Drechsler, A.* Lpldina. 24 (1888) 93-.

—, Breguet's. *Siber, T.* Schweigger J. 20 (1817) 465-.

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metallic, Breguet's. *Breguet, L. A. C.* 3 (1841) 506-.

—, — and Holzmann's. *Neumann, A.* Baumgartner Z. 10 (1832) 284-.

—, calculation. *Bonnesen, E.* Fsohr. Ps. (1884) (Ab. 2) 325-.

—, first. *Gerland, E.* Lpldina. 24 (1888) 160-.

—, for high temperatures. *Walker, Rich.* Tilloch Ph. Mg. 36 (1810) 119-.

—, Regnier's. *Brisson, B.* Par. Mm. de l'I. 2 (1796) (H.) 18-.

—, solution of 2 problems. *Argand, —.* Geronne A. Mth. 4 (1813-14) 29-.

—, Winnerl's. *Winnerl, —.* As. Nr. 7 (1829) 217-.

metastatic. *Grellois, E.* (xii) Metz Ac. Mm. 50 (1870) 375-.

—, corrections. *Scheurer-Kestner, —.* C. B. 121 (1895) 553-.

new, theory. *Schreiber, C. A. P.* Carl Rpm. 11 (1875) 1-.

petroleum ether. *Kohlrausch, F. A.* Ps. C. 60 (1897) 463-.

—, —. *Mewes, R.* Dingler 315 (1900) 785-.

potassium-sodium. *Baly, E. C. C., & Chorley, J. C.* Berl. B. 27 (1894) 470-.

pressure. *Mitscherlich, A. D.* Nt. Tbl. (\*1875) 96.

quartz, for high temperatures. *Dufour, A.* C. R. 130 (1900) 775-.

sensitive. *Joule, J. P.* Manch. Ph. S. P. 3 (1862-63) 73-.

spiral, Breguet's. *Holtz, W.* N.-Vorp. Mt. 17 (1886) 63-.

—, Florentine. *Schiff, H. C.* Ztg. 19 (1895) 2273.

steam-pressure. *Thomson, (Sir) W.* Edinb. R. S. P. 10 (1880) 432-, 532-.

sulphuric acid, noteworthy property. *Donle, W.* Z. Instk. 13 (1893) 238-.

and temperature. *Thirion, J.* Rv. Quest. Sc. 31 (1892) 353-.

unimetallic. *Tremeschini, —.* As. Fr. C. B. (1878) 493-.

with vapour tension scale. *Fuchs, P.* Z. Angew. C. (1896) 869-.

weight-, comparable with mercury thermometer. *Barbier, É.* C. R. 99 (1884) 752-.

Thermometric studies. *Guillaume, C. É.* Par. Poids et Mes. Tr. Mm. 5 (1886) 92+ clxx pp.

Thermoscope, new. *Looser, G.* Bonn NH. Vr. Cor.-Bl. (1894) 11-.

—, wire and optical arrangement. *Swan, W.* [1883] Sc. S. Arts T. 11 (\*1887) 54-.

Zero, change. *Bellani, A.* Bb. Un. 21 (1822) 252-; *Brugnatelli G.* 5 (1822) 268-.

—, —. *Gay-Lussac, L. J.* A. C. 21 (1822) 330-.

—, —. *Kämtz, L. F.* Schweigger J. 40 (=Jb. 10) (1824) 200-.

—, —. *Yelin, J. C. von.* Kastner Arch. Ntl. 3 (1824) 109-.

—, —. *Arago, D. F. J.* A. C. 33 (1827) 422-.

- Zero, change. *Legrand, J. N.* A. C. 63 (1836) 368-; C. R. 4 (1837) 178-.
- , —. *Despretz, C.* C. R. 4 (1837) 926-.
- , —. *Gintl, W.* Baumgartner Z. 5 (1837) 117-.
- , —. *Bellani, A.* [1839] Mod. Mm. S. It. 22 (1841) 76-.
- , —. *Person, C. C.* C. R. 19 (1844) 1314-.
- , —. *Adie, J.* Edinb. N. Ph. J. 49 (1850) 122-.
- , —. *Joule, J. P.* Manch. Lt. Ph. S. P. 6 (1867) 161-.
- , —. *Zink, —.* Würtb. Jh. 28 (1872) 124-.
- , —. *Joule, J. P.* Manch. Lt. Ph. S. P. 12 (1873) 73.
- , —. *Pernet, J.* Wien Met. Z. 14 (1879) 206-, 263.
- , —. *Crafts, —.* Nass. Vr. Jb. 38 (1885) 159.
- , —. *Heycock, C. T.* Camb. Ph. S. P. 7 (1892) 319.
- , —. *Bartoli, A.* Mil. I. Lomb. Rd. 29 (1896) 247-.
- , —. *Marchis, L.* C. R. 123 (1896) 799-; 124 (1897) 493-; 125 (1897) 294-, 434-, 472; Z. Ps. C. 29 (1899) 1-.
- , —, secular. *Baudin, L. C.* C. R. 115 (1892) 933-.
- , —, determination. *Giordano, G.* Nap. Rd. 11 (1872) 235-.
- , —. *Tellier, C.* C. R. 75 (1872) 578-.
- , —. *Craig, B. F.* Am. C. 3 (1873) 325.
- , —. *Krebs, G.* Carl Rpm. 10 (1874) 207-.
- , —. *Harker, J. A.* R. S. P. 60 (1897) 154-.
- , —, fall. *Crafts, J. M.* C. R. 94 (1882) 1298-.
- , —, course. *Böttcher, A.* Z. Instk. 8 (1888) 409-.
- , —, effect of composition of glass. *Weber, R.* Berl. Ak. Sb. (1883) 1233-.
- , —, freedom from. *Weber, R.* D. Nf. Tbl. (1889) 249-.
- , —, rise. *Flaugergues, H.* Bb. Un. 20 (1822) 117-.
- , —. *Crafts, J. M.* C. R. 91 (1880) 291-.
- , —. *Young, S.* Nt. 41 (1890) 152.
- , —. *Tomlinson, H.* Nt. 41 (1890) 198.
- , —. *Mills, E. J.* Nt. 41 (1890) 227.
- , —. *Young, S.* Nt. 41 (1890) 271-, 488-.
- , —. *Mills, E. J.* Nt. 41 (1890) 537-.

### 1230 Electrical Thermometry.

- Bolometer. *Langley, S. P.* Am. Ac. P. 16 (1881) 342-.
- , —. *Crova, A.* A. C. 29 (1893) 137-.
- , —, measurements with by zero method. *Crova, A.* As. Fr. C. R. (1892) (Pt. 1) 178-.
- , —, —, —. *Wadsworth, F. L. O.* Asps. J. 5 (1897) 268-.
- , —, sensitiveness. *Guye, C. E.* Arch. Sc. Ps. Nt. 24 (1890) 669-.
- , —, surface-construction. *Lummer, O., & Kurlbaum, F.* Z. Instk. 12 (1892) 81-.
- , —, theory. *Reid, H. F.* Am. J. Sc. 35 (1888) 160-.
- , —. *Guye, C. E.* Arch. Sc. Ps. Nt. 27 (1892) 26-.

### MEASUREMENT OF TEMPERATURE.

- by aid of telephone. *Lenz, R.* St. Pét. Ac. Sc. Bll. 29 (1884) 291-.
- , —, resistance method. *Siemens, C. W.* R. I. P. 6 (1872) 438-.
- , —. *Bartoli, A., & Somigliana, C.* Mil. I. Lomb. Rd. 29 (1896) 275-.
- , — (high temperatures). *Griffiths, E. H.* Nt. 53 (1895-96) 389-.
- , —. *Clark, G. M.* Elect. 38 (1897) 175-, 241-, 273-, 371-, 747-.
- , —. *Chrustschow, P., & Sitnikow, A.* Fschr. Ps. (1898) (Ab. 2) 257.
- , —, and thermoelectric method. *Guillaume, C. É.* Lum. Élect. 28 (1898) 201-, 312-, 409-, 454-, 566-, 601-.
- , —, — (high temperatures). *Holborn, L., & Wien, W.* Z. Instk. 12 (1892) 257-, 296-.
- , —, —. *Blondin, J.* Lum. Elect. 47 (1893) 21-, 75-, 125-.

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- Regnault, V.* Bb. Un. Arch. 10 (1849) 265-; 11 (1849) 5-, 265-.
- Boutan, A.* C. R. 47 (1858) 74-.
- (Boutan.) *Becquerel, A. C.* C. R. 47 (1858) 173-, 717-.
- Rossetti, F.* N. Cim. 26 (\*1867) 404-.
- Arsonval, A. d'.* Lum. Élect. 5 (\*1881) 40-.
- Rosenthal, J.* [1894] Erlang. Ps. Md. S. Sb. 26 (1895) 40-.
- Aubel, E. van, & Paillot, R.* Arch. Sc. Ps. Nt. 33 (1895) 149-.
- Fessenden, R. A.* Nt. 53 (1895-96) 244-.
- Jacobus, D. S.* Am. As. P. (1900) 151.
- of flames. *Waggener, W. J.* Berl. Ps. Gs. Vh. (1895) 78-; A. Ps. C. 58 (1896) 579-.
- , —. *Berkenbusch, F. A.* Ps. C. 67 (1899) 649-.
- , —, high temperatures. *Becquerel, A. C.* A. C. 31 (1826) 371-.
- , —, —. *Siemens, E. W. von, & Halske, J. G.* (XII) Elekttech. Z. 2 (1881) 246-.
- , —. *Le Chatelier, H.* Par. S. Ps. Sé. (1886) 100-; Gén. Civ. 10 (1886-87) 291-.
- , —, —. *Barus, C.* U. S. Gl. Sv. Bll. No. 54 (1889) 313 pp.
- , —, —. *McCrae, J. A.* Ps. C. 55 (1895) 95-.
- , —, —, calibration. *Lindeck, S., & Rothe, R.* Z. Instk. 20 (1900) 285-.
- , —, —. *Nichols, E. L.* Arch. Néerl. 5 (1900) 339-.
- , —, —, present status of research. *Barus, C.* Am. J. Sc. 48 (1894) 332-.
- , —, —, interpolation formulæ. *Holman, S. W.* Am. Ac. P. 31 (1896) 193-.
- , —, —, by iron-constantan couple. *Aubel, E. van.* Arch. Sc. Ps. Nt. 6 (1898) 169-.
- , —, —, of underground and atmospheric temperature. *Becquerel, A. C.* C. R. 46 (1858) 1183-.
- , —, —, temperature. *Becquerel, A. C., & Breschet, —.* Bb. Un. 7 (1837) 173-.
- , —, —. *Becquerel, E. C.* R. 56 (1863) 1057-.
- , —, —. *Pernet, J.* (x) Wild Rpm. Met. 2 (1872) 85-.

- Platinum temperatures. *Dickson, J. D. H.* Ph. Mg. 44 (1897) 445-.
- thermometry. *Callendar, H. L.* Ph. Mg. 47 (1899) 191-.
- , *Chree, C.* [1899] R. S. P. 67 (1901) 3-.

## PYROMETERS.

- Heräus, W. C.* Z. Angew. C. (1895) 431-.
- electric. *Siemens, C. W.* I. and S. I. J. 1 (1871) 50-.
- , *Abney, (Lt.)* —. Ph. Mg. 44 (1872) 80.
- (Siemens's). *Brit. Ass. Comm. (Foster, G. C.)* B. A. Rp. (1874) 242-.
- , *Braun, F.* Elekttech. Z. 9 (1888) 421-.
- (Braun's). *Palaz, A.* Lum. Élect. 30 (1888) 65-.
- , *Roberts-Austen, W. C.* [1893] Elect. 32 (1894) 41-.
- , *Montpellier, J. A.* Sc. Abs. 3 (1900) 859.
- modification of Siemens's. *Spohr, J.* Dingler 257 (1885) 315-.
- platinum. *Callendar, H. L.* I. & S. I. J. (1892) (No. 1) 164-.
- technical. *Heräus, W. C., Keiser, —, & Schmidt, —.* Z. Instk. 15 (1895) 373-.
- thermoelectric. *Le Chatelier, H.* Par. S. C. Bll. 47 (1887) 2.
- , *Schoentjes, H.* Arch. Sc. Ps. Nt. 5 (1898) 136-.
- , *Le Chatelier's, Rigaut, A.* Lum. Élect. 36 (1890) 308-.
- , —, *Struthers, J.* Sch. Mines Q. N. Y. 12 (1891) 143-; 13 (1892) 221-.
- , —, *Damour, E.* Berg-Hm. Ztg. 51 (1892) 277-; 301-; 310-.
- , —, *Heräus, W. C.* [1895] Z. Elektch. (1895-96) 276-.
- , —, *Ernst, C. von.* Oestr. Z. Brgw. 45 (1897) 300-.
- , —, automatic methods of observation. *Roberts-Austen, W. C.* I. & S. I. J. (1891) (No. 1) 90-.
- , —, calibration. *Holman, S. W.* Am. Ac. P. 31 (1896) 234-.
- , —, for melting-point of cast iron. *Moldenke, R.* Sc. Abs. 2 (1899) 282.
- , —, new form. *Jacobus, D. S.* Am. As. P. (1900) 151.
- , recording. *Roberts-Austen, W. C.* I. & S. I. J. (1893) (No. 1) 112-.
- , —, *Stansfield, A.* L. Ps. S. P. 16 (1899) 103-; Ph. Mg. 46 (1898) 59-.

- Thermograph, thermoelectric, and lunar radiation. *Hutchins, C. C., & Owen, D. E.* Am. Ac. P. 24 (1889) 125-.

## THERMOMETERS.

- Guillaume, C. É.* Par. Poids et Mes. PV. (1891) 53-.
- differential resistance. *Mendenhall, T. C.* Am. J. Sc. 30 (1885) 114-.
- electric. *Solly, E.* Ph. Mg. 19 (1841) 391-.
- contact. *Grunmach, L.* Z. Instk. 9 (1889) 296-.

- electric, for low temperatures. *Witkowski, A.* Krk. Ak. (Mt.-Prz.) Rz. 3 (1891) 880-; Cro. Ac. Sc. Bll. (1891) 198-.
- , —, —, *Rr.* Dingler 304 (1897) 57-.
- , in medicine. *Guérout, A.* Lum. Élect. 4 (\*1881) 153-.
- , modification. *Mascart, É.* J. de Ps. 2 (1873) 313-.
- , registering. *Morin, A. J.* C. R. 64 (1867) 327-.
- resistance-. *Siemens, C. W.* (vi Add.) Ph. Mg. 21 (1861) 73-.
- , —, *Shaw, W. N.* B. A. Rp. (1888) 590-.
- platinum. *Griffiths, E. H.* [1890] Phil. Trans. (A) 182 (1892) 43-.
- , *Wade, E. B. H.* Camb. Ph. S. P. 9 (1898) 526-.
- , *Chappuis, —.* Par. Poids et Mes. PV. (1899) 157-.
- , construction. *Callendar, H. L.* Ph. Mg. 32 (1891) 104-.
- , direct reading. *Clark, G. M.* B. A. Rp. (1894) 758.
- , —, *Appleyard, R.* [1895] L. Ps. S. P. 14 (1896) 74-; Ph. Mg. 41 (1896) 62-.
- , for low temperatures. *Griffiths, E. H., & Clark, G. M.* [1892] Camb. Ph. S. P. 8 (1895) 2-.
- , standardising. *Callendar, H. L., & Griffiths, E. H.* [1890] Phil. Trans. (A) 182 (1892) 119-.
- quick-indicating. *Genglaire, E.* Lum. Élect. 46 (1892) 372-.

- Thermomultiplier. *Nobili, L.* Bb. Un. 44 (1830) 225-.
- Thermophone. *Whipple, G. C.* Science 2 (1895) 639-.
- , *Whipple, G. C., & Warren, H. E.* [1899] Sc. Abs. 3 (1900) 69.
- Thermopile, differential. *Beaulieu-Marcconay, K. (Frhr.) von.* Humb. 5 (1886) 224-.
- , new. *Rubens, H.* Z. Instk. 18 (1898) 65-; 137.
- , — (Rubens). *Czermak, P.* Z. Instk. 18 (1898) 135-.
- Thermoscope, electric. *Ascoli, M.* Rm. B. Ac. Linc. Rd. 6 (1890) (Sem. 1) 449-.
- , —, differential. *Nosworthy, W. F.* Tel. J. 11 (1882) 167-.

## 1240 Temperature Measurement by Calorimeter, Vapour Density, Transpiration, Viscosity, etc.

- Air-calorimeter. *Gezekhus, N. A.* [1882] (xii) Rs. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 10-.
- Calorimetric methods. *Aronval, A. d'.* Lum. Élect. 13 (1884) 361-, 405-, 445-, 493-.
- Evaporation of carbon-tetrachloride. *Müller-Erzbach, W.* D. Nf. Vh. (1894) (Th. 2, Hälfte 1) 72-.

## 1240 Physical Thermometry

- Evaporation as means of measuring temperature. *Müller-Ersbach, W.* Exner Rpm. 24 (1888) 575-; Met. Z. 5 (1888) 453-; Z. Instk. 10 (1890) 88-.
- Furnace temperature, determination. *Beunier, —, & Gallois, —.* J. Mines 12 (1801) 272-; 16 (1804) 37-, 81-, 193-.
- , —. *Appolt, —.* Berg-Hm. Ztg. 15 (1856) 165-.
- Gases, temperature measurements by refractivity. *Berthelot, D.* Par. Ms. H. Nt. Bll. 4 (1898) 301-.
- High temperatures, measurement. *Wilson, John.* ME. I. P. (1852) 53-.
- , — (Wilson's method). *Kohlmann, —.* Halle Z. Nw. 2 (1858) 115-.
- , —. *Beutel, E.* Wien Az. 36 (1899) 261-.
- , —. *Berthelot, D.* Par. S. C. Bll. 23 (1900) 322-.
- , — by maldometer. *Ramsay, W., & Eumorfopoulos, N.* L. Ps. S. P. 14 (1896) 105-; Ph. Mg. 41 (1896) 360-.
- , —. —. Weinhold's calorimeter. *Schneider, C. H.* Carl Rpm. 11 (1875) 116-.
- Hydopyrometer for metallurgists' use. *Andrée, S. A.* Jern-Kont. A. 39 (1884) 173-; Berg-Hm. Ztg. 43 (1884) 506-.
- Lava from Etna, temperature. *Bartoli, A.* Catania Ac. Gioen. At. 3 (1891) 61-; Catania Ac. Gioen. Bll. 29 (1892) 2-; Mil. I. Lomb. Rd. 29 (1896) 363-.
- Modern calorimeters and their use. *Struthers, J.* Sch. Mines Q. N.Y. 16 (1895) 201-.
- Pyrometer. *Mensching, J., & Meyer, V.* Gött. Nr. (1887) 128-.
- , acoustic. *Cagniard-Latour, C., & Demonferrand, F.* C. R. 4 (1837) 28-.
- , —. *Mayer, A. M.* Am. J. Sc. 4 (1872) 427-.
- , —. *Chautard, J.* J. de Ps. 3 (1874) 78-; C. R. 78 (1874) 128-.
- , —. *Sanford, F.* Ps. Rv. 1 (1894) 140-.
- , calorimetric. *Byström, O.* Stockh. Ötv. 19 (1862) 159-.
- , —. *Salleron, J.* Les Mondes 37 (1875) 500-.
- , micrometric. *C., H. T.* QJ. Sc. 6 (1819) 230-.
- , platinum. *Hoadley, J. C.* Franklin I. J. 84 (1882) 91-.
- , —. water. *Hoadley, J. C.* Franklin I. J. 84 (1882) 169-, 252-.
- , steam. *Johnson, W. R.* Silliman J. 22 (1832) 96-.
- , water-circulation. *Amagat, E. H.* C. R. 97 (1883) 1053-.
- Pyrometric bricks of clay, effect of prolonged exposure to heat. *Guyton de Morveau, L. B.* A. C. 78 (1811) 73-.
- cylinders, Wedgwood's, manufacture. *Gazeran, —.* A. C. 36 (1800) 100-.
- Thermometer, acoustic. *Preston, S. T.* Ph. Mg. 32 (1891) 58-.
- , —. *Quincke, G.* A. Ps. C. 63 (1897) 66-.
- , —. *Anon.* Rv. Sc.-Ind. 31 (1899) 30-.
- , —. *Anon.* Rv. Sc.-Ind. 31 (1899) 68-.
- , aspiration. *Fuchs, P.* Z. Instk. 18 (1898) 337-.

## Special Thermometers 1250

- Thermometer, electro-capillary. *Debrun, E.* C. R. 89 (1879) 755-.
- , float-. *Fuchs, K.* Exner Rpm. 27 (1891) 118-.
- Thermophone, for measurement of high temperatures. *Wiborgh, J.* [1896] Jern-Kont. A. 51 (1897) 102-; Berg-Hm. Ztg. 55 (1896) 247-.
- , Wiborgh's. *Jüptner, H. (Frhr.) von.* Oestr. Z. Brgw. 45 (1897) 99-.
- Thermoscope, differential viscosity. *Thomson, (Sir) W.* Edinb. R. S. P. 10 (1880) 537-.
- , new. *Baur, C.* (xii) Berl. Ps. Gs. Vh. 1 (1882) 47-.
- , —. *Coleman, J. J.* Glasg. Ph. S. P. 15 (1884) 94-.
- , — principle. *Leroux, F. P.* L'I. 29 (1861) 6-.
- , thermomagnetic. *Thomson, (Sir) W.* Edinb. R. S. P. 10 (1880) 538-.
- Transition temperatures as fixed points in thermometry. *Meyerhoffer, W., & Saunders, A. P.* Z. Ps. C. 27 (1898) 367-.
- , —, —, —. *Richards, T. W., & Churchill, J. B.* Z. Ps. C. 28 (1899) 313-.
- Viscosity of gases at high temperatures. *Barus, C.* Am. J. Sc. 35 (1888) 407-.
- Water vapour pressure, measurement by. *Shaw, W. N.* [1883] Camb. Ph. S. T. 14 (\*1889) 30-.
- ### 1250 Special Thermometers (Maximum, Minimum, Self-recording, etc.).
- (See also Meteorology 0250.)
- Furnace temperature, autographic record. *Roberts-Austen, —.* I. & S. I. J. (1892) (No. 2) 33-.
- Microthermometer. *Laroque, F.* C. R. 97 (1883) 1207-.
- Pyrometers. *Fourmy, —.* J. Mines 14 (1803) 423-; 28 (1810) 427-.
- , —. *Miller, A.* Edinb. N. Ph. J. 44 (1848) 126-.
- , —. *Decharme, C. J.* [1877] (xii) M.-et-L. S. Ac. Mm. 34 (1878) 112-.
- , differential, water circulation. *Knab, L.* Gén. Civ. 16 (1889-90) 327-.
- , hot blast, Krupp's. *Bergen, A. von.* I. & S. I. J. (1886) 207-.
- , registering. *Daniell, J. F.* Phil. Trans. (1830) 257-; (1831) 443-.
- , —. *Bristol, W. H.* [1900] Sc. Abs. 4 (1901) 294-.
- , — heat developed in lightning discharge. *Raasche, G.* Riga Cor.-Bl. 38 (1895) 91-.
- Pyrometry at high temperatures by water circulation. *Lauth, C., & Vogt, G.* [1886] Gén. Civ. 10 (1886-87) 78-.
- Pyroscope of fire-station on St. Peter's tower in Munich. *Steinheil, C.* [A.] von. Münch. Ab. 3 (1837-43) 561-.
- Pyroscopes. *Ledieu, A. C. H.* C. R. 94 (1882) 1274-.

Thermograph, Hough's. *Grugan, F. C.* [U.S.]  
Chief Sig. Off. A. Rp. (\*1877) 510-.

## THERMOMETERS.

alarm or signalling. *Morin, J.* C. R. 59 (1864)  
1082.  
— — — — — *Palmieri, L.* (x) Nap. Rd. 12 (1873)  
59-.  
— — — — — *Barillé, —.* C. R. 118 (1894) 246-.  
— — — — — *Cochius, F. C.* Ztg. 19 (1895) 1733.  
— — — — —, to indicate presence of icebergs.  
*Michel, R. F.* C. R. 78 (1874) 1066-.  
baroscopic. *F. Gén. Civ.* 18 (1890-91) 308-.  
black-bulb in vacuo. *Busoni, D.* (ix) Ven.  
Aten. At. 3 (1866) 529-.  
— — — — — *Wilson, J. M.* Ph. Mg. 31 (1866)  
104-, 261-.  
— — — — — (Wilson). *Tyndall, J.* Ph. Mg.  
31 (1866) 191-.  
— — — — — *Vernon, G. V.* Manch. Lt. Ph.  
S. P. 11 (1872) 129-.  
— — — — — *Hicks, J. J.* [1874] Met. S. QJ.  
2 (1875) 99-.  
— — — — — *McLeod, H.* B. A. Rp. (1889)  
505-.  
calorimetric, delicate. *Pickering, S. U.* L. Ps.  
S. P. 8 (1887) 8-; Ph. Mg. 21 (1886) 330-; L.  
Ps. S. P. 8 (1887) 229-; Ph. Mg. 23 (1887) 401-.  
—, *Pickering's.* *Wegscheider, R.* Z. Instk. 6  
(1886) 266-.  
contact. *Fourier, J. B. J.* A. C. 37 (1828)  
291-.  
deep sea (Six's). *Aboville, —.* J. Mines 9  
(1798-99) 75-.  
— — — — — *Dietrichson, J. L. W.* A. Ps. C. 148  
(1878) 298-.  
— — — — — *Jones, J. R.* R. S. P. 24 (1876) 321-.  
— — — — — *Chabaud, V.* C. R. 114 (1892) 65-.  
— — — — — *Biétrix, E.* Par. S. Phlm. Bll. 6 (1894)  
59-.  
— — — — —, tests. *Thoulet, J.* Rv. Mar. et Col. 122  
(1894) 204-.  
— — — — —, electrical. *Siemens, (Sir) C. W.* [1882]  
R. S. P. 34 (1888) 89-.  
— — — — —, *Siemens's.* *Bartlett, J. R.* [1882]  
Am. As. P. 31 (1883) 221-.  
differential (Leslie's). *De Butts, E.* [1814]  
Am. Ph. S. T. 1 (1818) 301-.  
— — — — — *Houard, W.* QJ. Sc. 8 (1820) 219-.  
— — — — — *Ritchie, W.* [1826] Phil. Trans. (1827)  
129-.  
— (Leslie's). *B., D.* Gleanings Sc. 2 (1830)  
23-.  
— — — — — *Kemp, K. T.* Edinb. J. Nt. Gg. Sc. 1  
(1830) 262-.  
— — — — — *Hall, M.* Ph. Mg. 8 (1836) 56-.  
— — — — — *Walferdin, H.* C. R. 14 (1842) 63-.  
— — — — — *Dupré, Anat.* As. Fr. C. R. 4 (1875) 420-.  
— — — — — *Dufour, H.* [1879-83] Laus. S. Vd. Bll.  
16 (1880) 655-; J. de Ps. 2 (1883) 321-.  
— air. *Brough, J. C.* Phm. J. 10 (1869)  
214-.  
— — — — — *Pfaundler, L.* [1875] Wien Ak. Sb.  
72 (1876) (Ab. 2) 729-.  
— mercury. *Mendelejeff, D. I.* Berl. B. 8  
(1875) 539-.  
distance-. *Wheatstone, (Sir) C.* B. A. Rp. 37  
(1867) (Sect.) 11-.

distance-. *Ferrini, R.* Mil. I. Lomb. Bd. 15  
(1882) 44-.  
— — — — — *Luvini, G.* (xii) Rv. Sc.-Ind. 14 (1883)  
177-.  
— — — — — *Becker, A.* Magdeb. Nt. Vr. Jbr. u. Ab.  
(1889) 32-.  
— — — — — *Moennich, P.* Z. Instk. 9 (1889) 122-.  
— — — — — *Puluj, J.* Wien Ak. Sb. 98 (1890) (Ab. 2a)  
1502-.  
— — — — —, for hot chamber. *Grosheims, H.* [1886]  
Mulhouse S. In. Bll. 57 (1887) 97-.  
— — — — —, of Morin and Barthélemy. *Meylan, E.*  
Lum. Élect. 32 (1889) 511-.  
house-, in form of watch. *Steinhauser, A.*  
Carl Rpm. 12 (1876) 388-.  
hypsometric. *Walferdin, H.* C. R. 17 (1843)  
904-.  
to indicate mean temperatures. *Jürgensen, J.*  
C. R. 3 (1836) 143-.  
for lecture purposes. *Bickerton, A. W.* N. Z.  
I. T. 7 (1874) 152-.  
marine. *Jamieson, R.* Tilloch Ph. Mg. 57  
(1821) 294-.  
maximum. *Magnus, G.* Pogg. A. 22 (1831)  
136-.  
— — — — — *Walferdin, H.* Par. S. Gl. Bll. 7 (1835-  
36) 193-; C. R. 40 (1855) 951-.  
— — — — — *Grüel, C. A.* Dingler 155 (1860) 192-.  
— — — — — *Geissler, H. A.* Ps. C. 123 (1864) 657-.  
— and minimum. *Keith, A.* [1795] Edinb.  
R. S. T. 4 (1798) 203-.  
— — — — — *Lemaistre, L. F.* J. Mines 7 (1798)  
473-.  
— — — — — *Gay-Lussac, L. J.* A. C. 3 (1816)  
90-.  
— — — — — *Landriani, M.* Brugnatelli G. 1  
(1818) 413-.  
— — — — — *MacVicar, J. G.* C. S. J. 10 (1858)  
221-; 11 (1859) 106.  
— — — — — *Symons, W.* C. S. J. 15 (1862)  
299-.  
— — — — — *Govi, G.* [1864] Tor. Lav. Sc.  
Fis. Mt. (1869) 5-.  
— — — — — *Codazza, G.* Tor. At. Ac. Sc. 5  
(1869-70) 711-.  
— — — — — *Denton, S. G.* [1874] Met. S. QJ.  
2 (1875) 193-.  
— — — — — *Duclaux, É.* J. de Ps. 5 (1876)  
13-.  
— — — — — *Kappeller, H.* Wien Met. Z. 18  
(1883) 225-; Moncalieri Oss. Bll. 8 (\*1883)  
87-.  
— — — — —, coloured liquids for filling. *Lüders-  
dorff, F.* Dingler 118 (1850) 360-.  
— — — — —, gas-. *Gar, A.* (vi Add.) N. Cim.  
18 (1863) 238-.  
— — — — —, Hicks's. *Stewart, B.* R. S. P. 10  
(1859-60) 312-.  
— — — — —, metallic (Hermann and Pfister's).  
*Hirsch, A.* [1868] Neuch. Bll. 8 (1870)  
221-.  
— — — — —, portable. *Jürgensen, L. U.* As.  
Nr. 14 (1837) 173-.  
— — — — —, registering. *Hall, M.* QJ. Sc. 4  
(1818) 43-.  
— — — — —, — — — — — *Delta (Δ).* Edinb. J. Sc. 10  
(1829) 159-.

## 1250 Thermometers Radiation Thermometry, Optical Pyrometry 1255

maximum and minimum, registering. *Lallemand, A.* C. R. 66 (1868) 812-.

—, —, *Macdougall, W.* Sc. Met. S. J. 3 (1873) 78-.

—, —, —, *Trouillet, (le capit.)* —. [1895] Doubs S. Mm. 10 (1896) 54-.

—, —, —, application of capillary phenomena. *Barbier, É.* (vi *Adds.*) Par. A. Obs. 7 (1863) 368-.

—, —, —, *Bertoni's. Serpieri, A.* Rm. Cor. Sc. 3 (1855) 14-.

—, —, —, *Marchi's. Marangoni, C.* N. Cim. 27 (\*1868) 318-.

—, —, —, relative merits of types. *Draper, D.* U. S. Weath. Bur. Bl. 11 (1894) 710-.

—, new. *Monaco, E.* Moncalieri Oss. Bl. 13 (1893) 12.

—, registering. *King, J.* Edinb. J. Sc. 9 (1828) 113-.

—, — (King's). *Delta (Δ).* Edinb. J. Sc. 9 (1828) 300-.

—, —, *Phillips, J.* B. A. Rp. (1832) 574-; (1856) (pt. 2) 41.

—, —, compensation. *Scott, W. L.* C. N. 1 (1860) 98-.

mercurial, electrically read at a distance. *Brown, H. T.* Nt. 23 (1881) 464-.

metastatic maximum, new. *Walferdin, H.* C. R. 46 (1858) 737-.

— mercurial, as maximum thermometer. *Walferdin, H.* C. R. 38 (1854) 770-.

minimum. *Walferdin, H.* Par. S. Gl. Bl. 7 (1835-36) 354-.

—, alcohol. *Pastorelli, F.* Br. Met. S. P. 4 (1869) 264-.

—, Rutherford's, modifications. *Walferdin, H.* C. R. 40 (1855) 899-.

—, —, new form. *Whipple, G. M.* B. A. Rp. 43 (1873) (Sect.) 50.

mining. *Birkner, —.* Jb. Berg. Hw. (1898) 108-.

for physiological purposes. *Marey, É. J.* C. R. 92 (1881) 1441-.

platinum, for freezing points of dilute solutions. *Griffiths, E. H.* Nt. 62 (1900) 563.

recording. *Harrison, M.* B. A. Rp. (1848) (pt. 2) 14-.

—, *Moberg, A.* [1859] (viii) Helsingf. Öfv. 5 (1863) 58-.

—, *Lewis, J.* Am. As. P. (1860) 21-.

—, *Hamilton, G.* As. S. M. Not. 25 (1865) 29-.

—, *Zech, P.* Würtb. Jh. 25 (1869) 101-.

—, *Bouziat, —.* (xii) Fr. S. Ag. Mm. (1876) (2) 455-.

—, *Mallock, A.* B. A. Rp. (1882) 477-.

—, *Artimini, F.* Rv. Sc.-Ind. 18 (1886) 201-.

—, *Russell, H. C.* N. S. W. R. S. J. 23 (1869) 335-.

—, horary. *Veladini, G.* Mil. G. I. Lomb. 3 (1842) 19-; 2 (1850) 55-.

—, metallic. *Maurer, J.* (xii) Z. Instk. 3 (1883) 308-.

—, —, maximum and minimum. *Burg, V.* [1883] Par. S. Bl. Mm. 35 (\*1884) (C.R.) 446-.

registering air-, construction. *Sprung, A.* U. S. Weath. Bur. Bl. 11 (1894) 718-.

—, for hot springs. *Guzzanti, C.* Rass. Sc. Gl. It. 2 (1892) 308-.

*Sikes', improvement.* *Adie, Rich.* Edinb. N. Ph. J. 54 (1858) 84-.

unaffected by radiation. *Joule, J. P.* [1867] Manch. Lt. Ph. S. P. 7 (1868) 35-.

with variable mercury filling. *Grützmacher, F.* Z. Instk. 16 (1896) 171-, 200-.

Thermometric instrument. *Bellani, A.* (vi *Adds.*) *Majocchi A.* Fis. C. 14 (1844) 62-.

— sunshine recorder, U. S. Weather Bureau. *Marvin, C. F.* U. S. Weath. Bur. Rp. (1898) 17-.

Thermoscope. *Rumford, B.* (Count) Par. Mm. de l'I. 6 (1806) 71-.

## 1255 Radiation Thermometry, Optical Pyrometry, etc.

"Absolute black" bodies, electrically heated. *Lummer, O., & Kurlbaum, F.* Berl. Ps. Gs. Vh. (1898) 106-.

Colour, relation to temperature. *Decharms, C.* (xii) M.-et-L. S. Ac. Mm. 32 (1875) 102-.

—, —, —, *Howe, H. M.* Rv. Un. Mines 49 (1900) 200-.

—, —, — (heated steel). *White, M., & Taylor, F. W.* [1899] Sc. Abs. 3 (1900) 243.

— thermoscope. *Rebenstorff, H. A.* Dresden Isis Sb. (1896) 31-.

Compensation pyheliometer, radiation measurement by. *Ångström, K.* A. Ps. C. 67 (1899) 633-.

### OPTICAL PYROMETRY.

*Crova, A.* [1880] Mntp. Ac. Mm. 10 (1884) 157-.

*Nichols, E. L.* Am. J. Sc. 19 (1880) 42-.

*Crova, A.* C. R. 92 (1881) 707-.

*Le Chatelier, H.* C. R. 114 (1892) 214-; Par. S. Ps. Sé. (1892) 132-.

(Le Chatelier.) *Becquerel, H.* C. R. 114 (1892) 255-.

(Becquerel.) *Le Chatelier, H.* C. R. 114 (1892) 340-.

(Le Chatelier.) *Becquerel, H.* C. R. 114 (1892) 390-.

*Violle, J.* C. R. 114 (1892) 734-.

*Crova, A.* C. R. 114 (1892) 941-.

*Berthelot, D.* Par. S. Ps. Sé. (1895) 135-; C. R. 120 (1895) 831-; 126 (1898) 410-.

Pyrometer. *St., H.* Oestr. Z. Brgw. 37 (1896) 326.

— (Mesuré and Nouel's). *Ernst, C.* Oestr. Z. Brgw. 38 (1890) 533-.

— (— — —). *Struthers, J.* Sch. Mines Q. N. Y. 12 (1891) 292-.

—, *Thwaitte, B. H.* I. & S. I. J. (1892) (No. 1) 183-.

Pyrometers. *Salomon, —.* Z. Angew. C. (1891) 440.

Red heat and "grey" heat. *Lummer, O.* Berl. Ps. Gs. Vh. (1897) 121-.

Refrangibility of emitted light, measurement by. *Dewar, J.* B. A. Rp. 48 (1878) 461-.



Refrangibility of emitted light, measurement by. *Crova, A.* C. R. 87 (1878) 979-; J. de Ps. 8 (1879) 196-; C. R. 90 (1880) 252-.

Rotatory polarisation, measurement by (Mesuré and Nouel's method). *Evrard, A. Gén. Civ.* 13 (1888) 48-.

### 1260 Comparison of Thermometers. Thermometric Scales. Reduction to Thermodynamic Scale. (See also Thermodynamics, 2400, etc.)

Absolute temperature. *Schreber, K. N.-Vorp. Mt.* 29 (1898) 45-.

—, dimensions. *Burton, C. V. Ph. Mg.* 24 (1887) 96-.

—, —. *Abraham, H. Lum. Elect.* 51 (1894) 66-.

— and low temperature. *Gleue, —.* [1899] *Lüneb. Nt. Vr. Jh.* 15 (1901) xvii-.

— zero of heat. *Dalton, J. Nicholson J.* 5 (1808) 94-.

— — —. *Benzenberg, J. F. Gilbert A.* 61 (1819) 363-.

— — —. *Clément, —, & Désormes, —.* J. de Ps. 89 (1819) 428-.

— — —. *Veinberg [Weinberg], Y. I.* [1868] (xii) *Mosc. S. Sc. Bll.* 8 (No. 3) (1870) 7-.

— — —. *Koppe, C. A. Ps. C.* 151 (1874) 642-.

— — —. *Klein, J. F. V. Nost. Eng. Mg.* 22 (1880) 279-.

— — — perfect gas-thermometer. *Rankine, W. J. M. Edinb. R. S. T.* 20 (1853) 561-.

Calibration. *Walferdin, H. C. R.* 17 (1843) 1195.

— *Krüger, A.* [1872] *Helsingf. Ötv.* 15 (1873) 52-.

— (Krüger). *Argelander, F. W. A.* [1873] *Helsingf. Ötv.* 16 (1874) 43-.

— *Lermantov, V. V. (xii) Rs. C. Ps. S. J.* 10 (Ps.) (1878) [(Pt. 1)] 244-.

— *Thiesen, M. Carl Rpm.* 15 (1879) 285-; 677-.

— *Broch, O. J. Par. Poids et Mes. Tr. Mm.* 5 (1886) 82 pp.

— *Offret, A. Fr. S. Mn. Bll.* 13 (1890) 405-.

— *Pernet, J., Jaeger, W., & Gumlich, E.* Berl. Ps. Reichsanst. Ab. 1 (1894) 39-.

— *Hulett, G. A. Z. Ps. C.* 33 (1900) 237-.

— and its errors. *Pernet, J., Jaeger, W., & Gumlich, E.* Berl. Ps. Reichsanst. Ab. 1 (1894) 17-.

—, method, Bessel's. *Rücker, A. W., & Thorpe, T. E. B. A. Rp.* (1881) 540-.

—, —, Hansen's. *Brown, C. G. V. Nost. Eng. Mg.* 29 (1893) 1-.

—, —, Kew. *Griffiths, E. H. Nt.* 52 (1895) 536.

—, — of least squares applied to. *Marek, W. J. Carl Rpm.* 15 (1879) 300-.

Calibration, method of least squares applied to. *Wright, T. W. Des Moines Anal.* 10 (1888) 83-.

—, —, Neumann's. *Russell, T. Am. J. Sc.* 21 (1881) 373-.

—, —, simple. *Holman, S. W. Am. Ac. P.* 17 (1882) 157-.

—, methods, report. *Rücker, A. W. B. A. Rp.* (1882) 145-.

— and standardising. *Pickering, S. U. Ph. Mg.* 21 (1886) 180-.

### COMPARISON OF THERMOMETERS.

*Watson, W. L. Ps. S. P.* 15 (1897) 122-; Ph. Mg. 44 (1897) 116-.

air, and liquid. *Pierre, J. I. C. R.* 27 (1848) 213-; Caen Ac. Mm. (1852) 1-.

alcohol and air. *White, A. C. Am. Ac. P.* 21 (1886) 45-.

— — mercury. *Flaugergues, H. Zach Cor.* 9 (1828) 435-.

Joule's and French standards. *Schuster, A. Manch. Lt. Ph. S. Mm. & P.* 9 (1895) 87-.

mercury. *Dorn, —. D. Nf. Tbl. (\*1874)* 174.

— *Thiesen, M., Scheel, K., & Sell, L. Berl. Ps. Reichsanst. Ab.* 2 (1895) 1-.

— and air. *Regnault, V. A. C.* 5 (1842) 83-; 6 (1842) 370-.

— — — (from 0° to 100° C.). *Waterston, J. J.* [1852] *R. S. P.* 6 (1850-54) 225-.

— — — (below 100° C.). *Waterston, J. J. Ph. Mg.* 15 (1858) 212-.

— — —. *Bosscha, J. C. R.* 69 (1869) 875-; *Arch. Néerl.* 4 (1869) 197-; *Amst. Vs. Ak.* 4 (1870) (Nt.) 69-; *Arch. Néerl.* 4 (1869) 461-.

— — —. *Rowland, H. A.* [1879] *Am. Ac. P.* 15 (1880) 75-.

— — —. *Grunmach, L. D. Nf. Tbl. (\*1881)* [45]-.

— — — (greatest differences). *Russell, T. Smiths. Misc. Col.* 33 (1888) *Art.* 4, 25-; (*Wash. Ph. S. Bll.* 9 (1887).)

— — — (between 100° and 300°). *Wiebe, H. F., & Böttcher, A. Z. Instk.* 10 (1890) 16-; 233-.

— (glass 59<sup>III</sup>) — —. *Mahlke, A. A. Ps. C.* 53 (1894) 965-.

— (—, 122<sup>III</sup> and resistance) — —. *Grützmacher, F. Z. Instk.* 15 (1895) 250-.

— (—) — —. *Lemke, H. Z. Instk.* 19 (1899) 33-.

—, of different glass. *Pierre, J. I. A. C.* 5 (1842) 427-.

— — — (between 0° and 100°). *Wiebe, H. F. Z. Instk.* 10 (1890) 435-.

—, enclosed scale and divided stem. *Gumlich, E., & Scheel, K. Z. Instk.* 17 (1897) 353-.

— and gas. *Chappuis, P. Par. Poids et Mes. Tr. Mm.* 6 (1888) 125 + CLXXXVII pp.; *Par. Poids et Mes. PV.* (1888) 26-.

—, high range (glass 59<sup>III</sup>). *Mahlke, A. Z. Instk.* 15 (1895) 171-.

— and hydrogen. *Crafts, J. M. C. R.* 95 (1882) 836-.

— — —. *Scheel, K. A. Ps. C.* 58 (1896) 168-.

- mercury and platinum (at low temperatures).  
*Griffiths, E. H.* B. A. Rp. (1890) 130-.
- — — *Ewan, T., & Gee, W. W. H.* Manch. Lt. Ph. S. Mm. & P. 4 (1891) 357-.
- — — *Waidner, C. W., & Mallory, F. J.* H. Un. Cir. [16 (1896-97)] 42-; Ph. Mg. 48 (1899) 1-.
- platinum and air (at low temperatures).  
*Dickson, J. D. H.* Ph. Mg. 45 (1898) 525-.
- — — gas. *Harker, J. A., & Chappuis, P.* [1899] Phil. Trans. (A) 194 (1900) 37-.
- — — of different purity. *Tory, H. M.* L. Ps. S. P. 17 (1901) 341-; Ph. Mg. 50 (1900) 421-.
- Rossetti's and mercury. *Rossetti, F.* As. Fr. C. R. (1879) 404-.
- Rowland's and Paris standard. *Day, W. S.* Ph. Mg. 46 (1898) 1-.
- below common temperature and for cold stations. *Marvin, C. F.* [U. S.] Chief Sig. Off. A. Rp. (1890) 650-.
- temperatures above 50°. *Pomplun, W. Z.* Instk. 11 (1891) 1-.
- between 250° and 600°. *Mahke, A. Z.* Instk. 14 (1894) 73-.
- Dynamical equivalent of temperature in water.  
*Rankine, W. J. M.* [1850-57] Edinb. R. S. T. 20 (1853) 191-; Edinb. R. S. P. 3 (1857) 5-, 287-.
- Errors of thermometers. *Campbell, W. D. C.* Cn. J. 1 (1856) 138-.
- — — *Russell, H. C.* [1876] N. S. W. R. S. J. 10 (1877) 35-.
- — — *Waldo, F.* Science 21 (1893) 99-.
- — — cause. *Provensali, F. S.* Rm. At. N. Linc. 26 (1873) 26-.
- — — of low range. *Pastorelli, F.* Met. S. QJ. 2 (1875) 407-.
- Graduation. *Dalton, J.* Nicholson J. 5 (1803) 34-.
- [Shortrede non] *Shortreed, R.* Gleanings Sc. 1 (1831) 87-.
- *Pearson, C. C.* C. R. 17 (1843) 657-.
- *Ackland, W.* [1867] Br. Met. S. P. 4 (1869) 23-.
- *Osborne, J. W.* Am. As. P. (1876) 75-.
- for Arctic expedition. *Welsh, J.* [1852] R. S. P. 6 (1850-54) 183-.
- of clinical thermometer. *Henry, C.* As. Fr. C. R. (1889) (Pt. 1) 254-.
- , Kelvin's absolute method. *Rose-Innes, J.* [1897] L. Ps. S. P. 16 (1899) 26-; Ph. Mg. 45 (1898) 227-.
- Kew corrections, charts. *Shaw, W. N.* B. A. Rp. (1888) 590.
- Scale of temperature. *Walker, Rich.* Tilloch Ph. Mg. 33 (1809) 166-; 35 (1810) 416-.
- — — *Dulong, P. L., & Petit, A. T.* A. C. 7 (1817) 113-, 225-, 337-.
- — — *H., —.* Gleanings Sc. 1 (1829) 271-.
- — — *B., D.* Gleanings Sc. 2 (1830) 23-.
- — — *Volpicelli, P.* Rm. At. 1 (1847-48) 91-.
- — — *Walferdin, H.* C. R. 41 (1855) 122-.
- Scale of temperature. *Crova, A.* [1872] Mntp. Mm. Ac. Sect. Sc. 8 (1872-75) 81-.
- — — *Brooks, F.* Am. S. CE. T. 15 (1886) 381-.
- — — *Salomon, F.* Z. Angew. C. (1891) 409-.
- — —, absolute and gas. *Houllevigue, L.* J. de Ps. 4 (1895) 110-.
- — —, arguments against new. *Anon.* C. Ztg. 15 (1891) 1157-.
- — —, centigrade. *Mendelejeff, D. I.* Berl. B. 7 (1874) 126-.
- , thermometric (Accademia del Cimento). *Libri, G.* A. C. 45 (1830) 354-.
- , —, centigrade. *Poggendorff, J. C.* A. Ps. C. 157 (1876) 352.
- , —, —, in Denmark and Norway. *Örsted, H. C.* Sk. Nf. F. 2 (1840) 65-.
- , —, —, and Fahrenheit. *Abbadie, A. T. d'.* C. R. 30 (1850) 570-.
- , —, —, —, reduction. *Tiberi, E.* Rv. Sc.-Ind. 30 (1898) 216-.
- , —, Central Physical Observatory. *Glasek, S.* [1892] St. Pet. Ac. Sc. Mm. (R.) 71 (1893) (App. No. 7) 32 pp.
- , —, Fahrenheit. *Gamgee, A.* Camb. Ph. S. P. 7 (1892) 95-.
- , —, —, divisions. *S. (vi Adds.) Thomson* A. Ph. 8 (1816) 26-.
- , —, —, zero. *Cayley, G.* Ph. Mg. 5 (1829) 88-.
- , —, new. *Forbes, G., & Preece, W. H.* B. A. Rp. (1889) 514-.
- , —, reduction to scale of heat. *Flaugergues, H.* J. de Ps. 82 (1816) 386-; 83 (1816) 209-.
- , —, standard. *Tittmann, O. H.* Science 12 (1888) 58-.
- , —, unification. *Guillaume, C. É.* Arch. Sc. Ps. Nt. 18 (1887) 341-.
- value of Joule's thermometers. *Schuster, A.* Ph. Mg. 39 (1895) 477-.
- Standard thermometers, comparison. *Benoit, J. R.* [1899] Par. Poids et Mes. Tr. Mm. 7 (1890) 132 pp.
- — — *Marek, W.* Z. Instk. 10 (1890) 283-.
- — — *Guillaume, C. É.* Par. Poids et Mes. Tr. Mm. 10 (1894) 33 pp.
- — —, construction. *Sheepshanks, R.* As. S. M. Not. 11 (1850-51) 233-.
- — —, — at Kew. *Griffiths, E. H.* [1895] Nt. 53 (1895-96) 39-.
- — —, Glaisher's and Kew. *Ellis, W.* Met. S. QJ. 3 (1877) 427-.
- — —, graduation at Kew. *Welsh, J. B. A.* Rp. (1853) (pt. 2) 34-.
- Temperatures, table. *Weyde, P. H. van der.* Am. I. T. (1860-61) 557-.
- Testing thermometers. *Bohnenberger, G. C.* Tübinger Bl. 1 (1815) 147-.
- — — *Guillaume, C. É.* Par. S. Ps. Sé. (1890) 61.
- — — (clinical). *Schuster, A.* Manch. Lt. Ph. S. Mm. & P. 8 (1894) 100-.
- — — *Anon. (? Kohlrusch, —.)* Z. Instk. 18 (1898) 76-.

- Testing thermometers of glass. *Anon.* C. Ztg. 12 (1888) 1521.  
 ——— (old glass). *Grützmacher, F.* Berl. Ps. Reichsanst. Ab. 3 (1900) 229-.  
 — below ice point. *Schreiber, P.* Z. Instk. 8 (1888) 206-.  
 — and spring barometers. *Schreiber, P.* Z. Instk. 6 (1886) 121-.  
 — in temperatures up to 300°. *Loewenhers,* D. Nf. Vh. (1890) (Th. 2) 90-.  
 Tests and tables. *Pernet, J., Jaeger, W., & Gumlich, E.* Berl. Ps. Reichsanst. Ab. 1 (1894) (App.) 3\*-.  
 Thermodynamic correction for air thermometer. *Rose-Innes, J.* Nt. 58 (1898) 77-.  
 ———. *Orr, W. McF.* [1898] Nt. 59 (1898-99) 126.  
 Thermometers used in determination of standard kilogram. *Marek, W. J.* Par. Poids et Mes. Tr. Mm. 1 (\*1881) D. 4-; 2 (\*1883) D. 5-; 3 (1884) D. 5-.  
 —, verification. *Péteaux, J.* [1896] Lyon S. Ag. A. 4 (1897) 1x-.  
 —, at freezing point of mercury. *Whipple, G. W.* L. Ps. S. P. 7 (1886) 288-; Ph. Mg. 21 (1886) 27-.  
 Thermometric corrections. *Grützmacher, F.* A. Ps. C. 68 (1899) 769-.  
 — fixed points. *Barus, C.* Am. Ac. P. 27 (1898) 100-.  
 ———. *Holman, S. W., Lawrence, R. R., & Barr, L.* Am. Ac. P. 81 (1896) 218-.  
 ———. *Griffiths, E. H.* Camb. Ph. S. P. 9 (1898) 224-.  
 — and boiling point of water. *Broch, O. J.* Par. Poids et Mes. Tr. Mm. 1 (\*1881) A. 41-.  
 ———, transition points. *Richards, T. W.* Am. J. Sc. 6 (1898) 201-.  
 ———. *Richards, T. W., & Churchill, J. G.* Am. Ac. P. 34 (1899) 275-.  
 — standard, practical. *Callendar, H. L.* Ph. Mg. 48 (1899) 519-.  
 Thermometry, boiling points for. *Holman, S. W., & Gleason, W. H.* Am. Ac. P. 28 (1888) 237-.  
 —, Mills's researches. *Rücker, A. W., & Thorpe, T. E.* Ph. Mg. 12 (1881) 1-, 184-.

#### RELATIONS INVOLVING EXPANSION AND STRESS.

#### 1400 General. (See also Chemistry 7245.)

- Adiabatic elastic constants. *Voigt, W.* Gött. Nr. (1888) 359-.  
 Atmosphere, limits. *Rudzkii, M.* N. Rs. S. Nt. Mm. (Mth.) 15 (1898) 71-; Fsch. Ps. (1893) (Ab. 1) 374.  
 Avogadro's law for homogeneous liquids. *Traube, J.* A. Ps. C. 61 (1897) 396-.  
 Cohesion, elasticity, expansion and temperature. *Forbes, G.* [1876] Edinb. R. S. P. 9 (1878) 141-.

- Compressed air. *Kraft, J. I.* OE. P. 79 (1885) 311-.  
 Compression, effects on thermal phenomena. *Hall, (Sir) J. Nicholson J.* 9 (1804) 98-; 13 (1806) 329-, 381-; 14 (1807) 13-, 113-, 196-, 302-.  
 —, thermal effects on solids. *Joule, J. P.* R. S. P. 8 (1856-57) 564-.  
 Dalton's and Gay-Lussac's laws deduced from equations of matter and energy. *Herran, A.* As. Fr. C. R. (1898) (Pt. 1) 134-.  
 Density and pressure, relation. *Challis, J.* Ph. Mg. 17 (1859) 401-.  
 Equilibrium laws, identity in physical, chemical and mechanical phenomena. *Le Chatelier, H.* Z. Ps. C. 1 (1887) 565-.

#### EXPANSION.

- of bodies. *Schröder, H.* Pogg. A. 52 (1841) 282-.  
 —. *Volpicelli, P.* Rm. At. 4 (1850-51) 216-; 12 (1858-59) 349-; 18 (1860) 187-, 204-, 357-.  
 —. *Barré de Saint-Venant,* —. L'I. 23 (1855) 440-.  
 —. *Laurent, J.* A. Gén. Civ. 4 (1875) 150-.  
 —. *Cassani, P.* Ven. I. At. (1892-93) 1655-.  
 —, dynamical study. *Schwartz, T.* (xii) Ausl. 54 (1891) 1021-.  
 —, law. *Tessan, — de.* C. R. 50 (1860) 20-.  
 —, —, universal, relating to. *Lévy, M.* C. R. 87 (1878) 449-, 676-.  
 —, —, —, — (Lévy). *Boltzmann, L.* C.R. 87 (1878) 593.  
 —, —, —, — (Boltzmann). *Lévy, M.* C. R. 87 (1878) 649.  
 —, —, —, — (Lévy). *Massieu, F.* C. R. 87 (1878) 731-.  
 —, —, —, — (-). *Boltzmann, L.* C. R. 87 (1878) 773.  
 —, especially liquids. *Weissenmann, A.* Zür. Vjschr. 33 (1888) 37-.  
 and compressibility, relation. *Grimaldi, G. P.* Rm. B. Ac. Linc. Bd. 2 (1886) (Sem. 1) 238-.  
 mechanism. *Saint-Venant, A. J. C. Barré de.* C. R. 82 (1876) 33-.  
 and pressure. *Saint-Venant, A. J. C. Barré de.* C. R. 87 (1878) 713-.  
 of solids and liquids. *Sankey, W. S.* Edinb. J. Sc. 1 (1829) 17-.  
 ———. *Thiesen, M., Scheel, K., & Sell, L.* Berl. Ps. Reichsanst. Ab. 2 (1895) 73-.  
 ———. *Thiesen, M., Scheel, K., & Diesselhorst, H.* Berl. Ps. Reichsanst. Ab. 3 (1900) 1-.  
 ——— and gases, law at high temperatures. *Dulong, P. L., & Petit, A. T.* [1815] A. C. 2 (1816) 240-.  
 ———. ———. ———. ———. ——— (Dulong and Petit). *Biot, J. B.* Par. S. Phlm. Bil. (1815) 107-.  
 — sulphur (various modifications). *Toepler, M.* A. Ps. C. 47 (1892) 169-.

- Gas laws, extension to homogeneous liquids. *Traube, J.* A. Ps. C. 61 (1897) 380-.
- Heat of compression of solids. *Spring, W.* Par. S. C. Bll. 41 (1884) 488-.
- — — and liquids. *Burton, C. I., & Marshall, W.* R. S. P. 50 (1892) 130-.
- , doctrine, particularly states of dense and elastic fluidity in bodies. *Astley, J.* Nicholson J. 5 (1802) 23-.
- and force, action on matter. *Dyer, J. C.* Manch. Ph. S. P. 3 (1862-63) 77-.
- Liquid and gaseous states. *Andrews, T.* [1886] Phil. Trans. (A) 178 (1888) 45-.
- Liquids and gases, theory. *Bakker, G.* Z. Ps. C. 12 (1893) 670-; 14 (1894) 446-; 17 (1895) 678-.
- — — solids at high temperatures. *Aitken, J.* (of *Darroch*). [1890] Nt. 23 (1881) 34-.
- Relations between different coefficients. *Amagat,* —. Par. S. Pa. S6. (1897) 18\*-.
- Stretching, thermal effects on solids. *Joule, J. P.* R. S. P. 8 (1856-57) 355-.
- Temperature and calorific phenomena. *Pictet, R.* [1879] Laus. S. Vd. Bll. 16 (1890) 452-.
- , effect on glass. *Amagat, E. H.* C. R. 110 (1890) 1246-.
- — — mechanical properties of metals. *Le Chatelier, A.* Gén. Civ. 19 (1891) 59-, 73-, 107-.
- — — tenacity of iron wire. *Dufour, (gén.)* G. H. Bb. Un. 22 (1823) 220-.
- — — — — metals. *Baudrimont, A.* Franklin I. J. 68 (1874) 37-.
- Thermo-elastic and thermal properties, relations. *Cornu, A.* J. de Ps. 2 (1873) 41-.
- Volume and specific heat, laws. *Phillips, S. E.* Nt. 30 (1884) 288-.
- Vulcanism. *Arrhenius, S.* Stookh. Gl. För. F. 22 (1900) 395-.
- Fizeau, H. L.* C. R. 66 (1868) 1005-, 1072-.
- Hirsch, A.* Neuch. Bll. 8 (1870) 456-.
- Buff, H.* A. Ps. C. 145 (1872) 626-.
- Handl, A.* Wien Ak. Sb. 70 (1874) (Ab. 2) 505-.
- Kurz, A.* A. Ps. C. Ergänz. 6 (1874) 314-.
- Glatsel, P.* A. Ps. C. 160 (1877) 497-.
- Russner, J.* Carl Rpm. 18 (1882) 655-.
- Pionchon, —.* [1889] C. R. 108 (1889) 992-; Bordeaux S. Sc. Mm. 5 (1890) xxii-.
- Coefficient of dilatation, theory. *Sayno, A.* Mil. I. Lomb. Rd. 23 (1890) 787-, 851-.
- Compensation of chronometers. *Cellérier, G.* Gen. S. Ps. Mm. 29 (1884-87) No. 6, 45 pp.
- pendulum. *Weber, R.* Neuch. S. Sc. Bll. 15 (1886) 169-.
- in signalling apparatus. *Hermand, —.* [1888] Gén. Civ. 4 (\*1888-94) 124-.
- Deformation, elastic, of sphere, due to heat. *Almansi, E.* Tor. Ac. Sc. At. 32 (1896) 701- or 963-.
- of thin circular disc for temperature as continuous function of distance from centre. *Niemöller, F.* Z. Mth. Ps. 24 (1879) 270-.
- Elastic solid, stresses due to unequal temperature. *Hopkinson, J. B. A.* Rp. 42 (1872) (Sect.) 51-.
- Expansion by cold. *Rankine, W. J. M.* Ph. Mg. 8 (1854) 357-.
- at high temperatures. *Le Chatelier, H. C.* R. 107 (1888) 862-.
- — — low temperatures. *Mayer, A. M.* [1886] Am. J. So. 40 (1890) 323-.
- — — — — *Zakrzewski, I.* Krk. Ak. (Mt.-Prz.) Rz. 20 (1890) 227-; Cro. Ac. Sc. Bll. (1890) No. 10, xix-.
- — — surface of separation of 2 solids. *Heen, P. de.* Liège S. Sc. Mm. 18 (1895) No. 2, 6 pp.
- Expansive force of substances. *Lagerhjelm, P.* Stookh. Ak. Hndl. 48 (1827) 164-.
- Glass for apparatus, to stand heating. *Winkelmann, A., & Schott, O.* Z. Instk. 14 (1894) 6-.
- Heat resulting from sudden cooling of solid body. *Mousson, A.* Bb. Un. 12 (1837) 418-.
- Influence of pressure. *Puschl, K.* [1875] Wien Ak. Sb. 72 (1876) (Ab. 2) 245-.
- — — residual viscosity. *Day, H. D.* Am. J. Sc. 2 (1896) 342-.
- Interference dilatometer, compensated. *Tutton, A. E.* Phil. Trans. (A) 191 (1898) 313-.
- Invariable pendulum, construction. *Koch, K.* R. D. Nt. Vh. (1899) (Th. 2, Hälfte 1) 39-.
- Isotropic body, free expansion. *Zehfuss, G.* Schlämilch Z. 8 (1863) 127-.
- Lengths of bars at temperature of melting ice. *Flint, A. R., Voigt, W., Wheeler, E. S., & Woodward, R. S.* Am. J. So. 25 (1883) 448-.
- Marine chronometers and watches, influence of temperature. *Birkenmajer, L.* Krk. Ak. (Mt.-Prz.) Rz. 10 (1896) 357-; Cro. Ac. Sc. Bll. (1896) 78-.

### 1410 Expansion of Solids by Heat.

(For Compressibility of Solids, see Mechanics, Elasticity 3200, etc.)

- Gilbert, L. W.* Gilbert A. 58 (1813) 231-.
- Galen, P. van.* Utr. A. Ac. (1826-27) 78 pp.
- Lechevallier, V.* Metz Mm. Ac. 10 (1828-29) 166-.
- Roberts, R.* B. A. Rp. (1850) (pt. 2) 16-.
- Pierre, J. I.* A. C. 33 (1851) 199-.
- Kopp, H.* Lieb. A. 81 (1852) 1-.
- Fick, A.* Pogg. A. 91 (1854) 287-.
- Kopp, H.* Lieb. A. 93 (1855) 129-; A. C. 47 (1856) 291-.
- Cuénoud, S.* [1860] Laus. Bll. S. Vd. 7 (1864) 160-.
- Dupré, A.* C. R. 59 (1864) 490-, 763-.
- Fizeau, H. L.* C. R. 62 (1866) 1101-, 1133-.
- Mousson, A.* Zür. Vjschr. 11 (1866) 175-.

## MEASUREMENT.

- Tralles, J. G. Berl. Mm. Ac. (1804) 12-.
- Mather, W. W. Silliman J. 30 (1836) 824-.
- Steinheil, C. A. von. Münch. Bl. Ak. (1843) 225-.
- Grünert, J. A. Grünert Arch. 6 (1845) 448-.
- Krist, J. Carl Rpm. 2 (1867) 65-.
- Müller, Joh. A. Ps. C. 135 (1868) 672-.
- Schellen, H. Carl Rpm. 5 (1869) 326-.
- Müller, Joh. Freiburg B. 5 (1870) (Heft 1) 81-.
- Wild, H. Arch. Sc. Ps. Nt. 41 (1871) 373-.
- Reusch, F. E. von. Carl Rpm. 13 (1877) 1-.
- Thoulet, J. C. R. 98 (1884) 620-.
- Artimini, F. Rv. Sc.-Ind. 18 (1886) 113-.
- Benoit, R. J. de Ps. 8 (1889) 253-, 451-.
- Morley, F. W. Am. As. P. (1891) 137-.
- Le Chatelier, —, & Coupeau, —. Par. S. Ps. 86. (1898) 3\*.
- Vandevyver, L. N. Brux. Ac. Bl. 35 (1898) 551-.
- Darwin, H. Nt. 60 (1899) 149.
- by comparator. Steinheil, C. A. von. Münch. Sb. (1870) (I) 1-.
- , Lenoir's. Prony, R. de. Bb. Brit. 19 (1802) 301-.
- , screw. Pernet, J. Arch. Néerl. 5 (1900) 895-.
- dilatometer, Abbe-Fizeau. Pulfrich, C. Z. Instk. 13 (1893) 365-, 401-, 437-.
- influence of change of temperature due to the expansion. Miller, A. [1883] Münch. Ak. Sb. 13 (1884) 17-; A. Ps. C. 20 (1883) 94-.
- by interference. Biervliet, A. van. Brux. S. Sc. A. 12 (1888) (Pt. 2) 215-.
- Newton's rings (thermomicrometer). Jerichau, E. B. Sk. Nf. F. 2 (1840) 234-; A. C. 4 (1842) 363-.
- pendulum. Weber, R. C. R. 103 (1886) 553-; Neuch. S. Sc. Bl. 15 (1886) 177-.
- , Guillaume, C. É. C. R. 103 (1886) 689-; Arch. Sc. Ps. Nt. 16 (1896) 393-.
- , Svirnikov, P. I. Kazan S. Nt. (Ps.-Mth.) P. 7 (1889) 3.
- , horizontal, to observe minute changes in dimensions. Rood, O. N. Am. J. Sc. 9 (1875) 444-.
- photography. Le Chatelier, —. [1888] S. C. In. J. 8 (1889) 638.
- in relation to standards. Bosscha, —. A. Cons. Arts et Mét. 10 (\*1873) 76-.
- , Benoit, J. R. Par. Poids et Mes. Tr. Mm. 2 (\*1883) C. 1-, C. 1-; 3 (1884) C. 1-, C. 1-.
- , Sadebeck, M. Lplidina. 19 (1883) 141-.
- , Rogers, W. A. Am. S. Mor. P. (1887) 5-.
- terms of wave lengths. Rogers, W. A. Am. Mcr. S. T. 17 (1895) 305-.

Molecular changes produced by changes of temperature in solids. Duhamel, J. M. C. Par. Mm. Sav. Étr. 5 (1838) 440-.

- Monument (Bunker Hill), effect of heat on perpendicularity. Horsford, E. N. Am. As. P. (1851) 81-.
- Phenomena accompanying change of volume in solids. Edlund, E. Stockh. Öfv. 18 (1861) 119-; Pogg. A. 114 (1861) 1-.
- Relation between thermal and elastic phenomena. Kupffer, A. T. St. Pét. Ac. Sc. Bil. 14 (1856) 273-, 289-.
- — — — — Mai, E. Mil. I. Lomb. Rd. 24 (1891) 1050-.
- — — expansion and melting point. Frenchen, P., & Poulsen, V. N. Ts. Fs. K. 1 (1896) 45-; C. Ztg. 20 (1896) (Rpm.) 125.
- — —, melting point and elasticity. Sayno, A. Mil. I. Lomb. Rd. 24 (1891) 574-.
- — —, temperature, and torsion modulus. Sayno, A. Mil. I. Lomb. Rd. 24 (1891) 293-.
- Rocker, Trevelyan, mechanical analysis. Frisbee, S. H. Nt. 17 (1878) 242-.

## SPECIFIED SOLIDS.

- Alloys. Wiedemann, E. E. G. [1877] A. Ps. C. 3 (1878) 237-.
- , Le Chatelier, H. C. R. 128 (1899) 1444-.
- , measurement of expansion. Hockin, C., & Matthiessen, A. Lb. 1 (1867) 89-, 149-.
- Aluminium bronze. Fontana, A. Rm. B. Ac. Linc. Rd. 3 (1894) (Sem. 2) 129-.
- Alums, measurement of expansion by dilatometer. Spring, W. Brux. Ac. Bl. 6 (1883) 685-; Berl. B. 17 (1884) 406-.
- Baily's metal, Jessup's steel and Chance's glass. Rogers, W. A. Am. As. P. (1837) 80-.
- Bismuth amalgams, contraction. Vicentini, G., & Cattaneo, C. Rm. R. Ac. Linc. Rd. 7 (1891) (Sem. 2) 95-.
- Brick-tower, daily motion caused by solar heat. Rockwood, C. G. Am. As. P. 20 (1871) 171-.
- Brickwork. Hawkes, W. Br. Archt. I. Pp. (1861) 121-.
- Building materials. Lang, C. [1873] (x) Carl Rpm. 10 (1874) 63-.
- Ceramic pastes and glazes. Le Chatelier, H. S. C. In. J. 14 (1895) 751.
- Cobalt at high temperatures. Quadrio-Curzio, A. Catania Ac. Gioen. Bl. 49 (1897) 16-.
- Crystalline alkali sulphates. Tutton, A. E. Phil. Trans. (A) 192 (1899) 455-.
- Crystals. Mitscherlich, E. Berl. Ab. (1825) 201-; Berl. B. (1837) 69-.
- , Hahn, H. C. (xii) Arch. Phm. 148 (1859) 19-.
- , Moutier, J. Par. S. Phlm. Bl. 2 (1878) 78-.
- , Blasius, E. A. Ps. C. 22 (1884) 528-.
- , form in relation to expansion. Mitscherlich, E. Pogg. A. 1 (1824) 125-.
- , glauberite. Brewster, (Sir) D. Ph. Mg. 1 (1832) 417-.
- and other solids, measurement of expansion. Voigt, W. A. Ps. C. 43 (1891) 831-.

- Crystals, trimetric, coefficients, axial density and crystalline parameters. *Schrauf, A.* A. Ps. C. 28 (1886) 438-.
- Diabase, contraction. *Barus, C.* Am. J. Sc. 42 (1891) 498-.
- Diamond. *Joly, J.* Nt. 49 (1893-94) 480-, 530-.
- and cuprous oxide. *Fizeau, H. L.* C. R. 60 (1865) 1161-.
- Ebonite. *Kohlrausch, F.* A. Ps. C. 149 (1873) 577-.
- Glass. *Bellani, A.* Brescia Cm. (1823) 57-; *Brugnatelli G.* 6 (1823) 20-, 217-, 274-.
- *Crichton, J.* Thomson A. Ph. 7 (1824) 241-.
- *Regnault, V.* A. C. 4 (1842) 64-.
- *Crafts, J. M.* C. R. 91 (1880) 413-.
- *Thiesen, M., & Scheel, K.* Z. Instk. 12 (1892) 293-; 13 (1893) 76.
- *Baudin, L. C.* C. R. 116 (1893) 971-.
- *Winkelmann, A., & Schott, O.* [1893] A. Ps. C. 61 (1894) 730-.
- *Granger, A.* Mon. Sc. 12 (1898) 681-.
- expansion in relation to chemical composition. *Grenet, L. C. N.* 76 (1897) 101-.
- Gypsum. *Beckenkamp, J. A.* Ps. C. Beibl. (1882) 650-.
- Ice. *Struve, F. G. W. von.* St. Pét. Ac. Sc. Mm. 6 (1850) (pte. 1) 297-.
- *Larsson, H., & Pettersson, O.* Stockh. Öfv. 36 (1890) No. 3, 65-.
- *Andrews, T. R. S. P.* 40 (1886) 544-.
- *Nichols, E. L.* Ps. Rv. 8 (1899) 184-.
- action on pile bridge, Rice Lake (Canada). *Clarke, T. C.* Cn. J. 3 (1854-55) 249-.
- expansion and contraction. *Dumble, J. H.* Cn. J. 3 (1858) 414-; 5 (1860) 418-.
- India-rubber. *Goulier, C. M.* Les Mondes 20 (1869) 11-.
- *Fuschl, K.* Wien Ak. Sb. 71 (1875) (Ab. 2) 95-.
- *Lebedev, I.* (xii) Rs. Ps.-C. S. J. 13 (Ps.) (1881) [(Pt. 1)] 246-.
- *Lundal, A. E.* A. Ps. C. 66 (1898) 741-.
- *Cantone, M., & Contino, G.* Mil. I. Lomb. Rd. 33 (1900) 215-.
- analogy with gelatin. *Bjerkén, P. von.* A. Ps. C. 43 (1891) 817-.
- contraction. *Gezekhus [Hesehus], N. A.* (xii) Rs. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 103-; J. de Ps. 3 (\*1884) 459-.
- elasticity and expansion. *Graetz, L. A.* Ps. C. 28 (1886) 354-.
- paraffins, etc. *Russner, J.* Carl Rpm. 18 (1882) 152-.
- stretched, behaviour when heated. *Schmulewitsch, J.* Zür. Vjschr. 11 (1866) 201-.
- — — — *Govi, G.* Tor. At. Ac. Sc. 2 (1866-67) 225-, 455-; 4 (1868-69) 571-.
- — — — *Schmulewitsch, J.* [1869] St. Pét. Ac. Sc. Bll. 14 (1870) 517-.
- — — — *Thomas, P.* Les Mondes 19 (1869) 575-.
- — — — (Thomas). *Govi, G.* Les Mondes 19 (1869) 640-.
- — — — (Govi). *Thomas, P.* Les Mondes 20 (1869) 8-.
- India-rubber, stretched, behaviour when heated. *Madan, H. G.* Nt. 32 (1885) 625.
- and wires, expansion and extensibility, relations. *Kurz, A.* Exner Rpm. 22 (1886) 547-; 27 (1891) 631-.
- Invar. *Hirsch, A.* Neuch. S. Sc. Bll. 25 (1897) 217-.
- Iron. *Hällström, G. G.* Stockh. Ak. Hndl. 26 (1805) 253-; Gilbert A. 36 (1810) 52-.
- *Zschau, E. F.* Dresden Sb. Isis (1865) 89-.
- , cast. *Musket, D.* Tilloch Ph. Mg. 18 (1804) 1-.
- , — *Mallet, R.* Franklin I. J. 69 (1875) 156-.
- and steel. *Abt, A.* (xii) Örv.-Term. Ét. 5 (1880) (Term. Szak) 105-.
- — — at high temperatures. *Le Chatelier, H. C. R.* 129 (1899) 331-.
- — — — welding temperatures. *Wrightson, T.* [1895] Phil. Trans. (A) 186 (1896) 598-.
- — — — zinc, determination of expansion. *Börsch, A.* As. Nr. 99 (1881) 177-.
- Marble. *Dunn, J., & Sang, E.* Edinb. N. Ph. J. 11 (1831) 66-.
- *Fröhlich, I. A.* Ps. C. 61 (1897) 206-.
- Masonry. *Bounceau, —.* Medley I. Eng. 2 (1865) 198-.
- Metal spiral. *Jacquez, E. A.* Tél. 7 (1880) 320-.
- Metallic arches. *Bresse, J. A. C.* L'I. 28 (1855) 257-.
- wires. *Dahlander, G. R.* Stockh. Öfv. 28 (1871) 703-; A. Ps. C. 145 (1872) 147-.
- Metals. *Prinsep, J.* Gleanings Sc. 1 (1831) 379-; (vi Add.) Bb. Un. 58 (1835) 160-.
- and alloys. *Matthiessen, A.* Phil. Trans. 156 (1866) 861-.
- — — *Hirsch, A.* Neuch. S. Sc. Bll. 16 (1888) 298-.
- — — and salts. *Crace-Calvert, F.* B. A. Rp. (1858) (pt. 2) 46-.
- , expansion by obscure heat. *Rogers, W. A.* Am. As. P. (1894) 65-.
- at high temperatures. *Le Chatelier, H. C.* R. 108 (1889) 1096-.
- — low temperatures. *Andrews, T. R. S.* P. 43 (1888) 299-.
- , measurement of expansion. *Nouel, A.* Gén. Civ. 10 (1886-87) 405-.
- — — by interference. *Morley, E. W., & Rogers, W. A.* Ps. Rv. 4 (1897) 1-, 106-.
- , quasi-isotropic, expansion and pressure. *Voigt, W.* Gött. Nr. (1893) 177-.
- , in relation to temperature of fusion. *Lémeray, —.* C. R. 131 (1900) 1291-.
- and other solids, measurement of expansion. *Nasmyth, J.* Edinb. J. Sc. 6 (1827) 225-; Pogg. A. 9 (1827) 608-.
- Minerals, unequal expansion in different directions. *Müller, W. H. B.* A. Rp. (1837) (pt. 2) 43-.
- Nickel and cobalt. *Tutton, A. E.* R. S. P. 65 (1900) 306-.
- steels. *Guillaume, C. É.* C. R. 124 (1897) 176-; 125 (1897) 235-, 342; Par. S. Pa. 84 (1897) 120-.

- Phosphorus. *De Franchis, G., & Pisati, G.* Gz. C. It. 4 (1874) 497-.
- , *Leduc, A.* C. R. 118 (1891) 259-.
- Platinum and brass. *Tissot, A.* Les Mondes 6 (1864) 317.
- , incandescent. *Nichols, E. L.* Am. As. P. (1881) 24-.
- , platinum, palladium, silver, nickel, iron, steel and constantan at high temperatures. *Holborn, L., & Day, A.* Berl. Ak. Sb. (1900) 1009-.
- Porcelain. *Bedford, T. G.* B. A. Rp. (1899) 245; L. Ps. S. P. 17 (1901) 148-; Ph. Mg. 49 (1900) 90-.
- , Bayeux (between 1000° and 1500°). *Sainte Claire-Deville, H., & Troost, L.* C. R. 59 (1864) 162-.
- Pottery clay mass. *Granger, A.* Mon. Sc. 18 (1899) 5-.
- Quartz. *Le Chatelier, H.* C. R. 108 (1889) 1046-.
- Rock crystal. *Fizeau, H. L.* C. R. 58 (1864) 923-; A. C. 2 (1864) 143-.
- Rocks. *Hallock, W.* U. S. G. Sv. Bill. No. 78 (1891) 109-.
- Salts. *Joule, J. P., & Playfair, L.* [1848] C. S. J. 1 (1849) 121-.
- containing water of crystallisation. *Wiedemann, E. E. G.* A. Ps. C. 17 (1882) 561-.
- Silica, fused. *Le Chatelier, H.* C. R. 180 (1900) 1708-.
- Silver chloro-brom-iodides. *Rodwell, G. F.* [1876] R. S. P. 25 (1877) 292-.
- iodide. *Rodwell, G. F.* [1874] R. S. P. 23 (1875) 97-.
- , bromide, and chloride. *Rodwell, G. F.* [1876] R. S. P. 25 (1877) 280-.
- , —, —, and some chloro-brom-iodides of silver. *Rodwell, G. F.* R. S. P. 31 (1881) 291-.
- iodides and double iodides of silver with copper and lead. *Bellati, M., & Romanese, R.* Ven. I. At. 1 (1883) 1043-.
- , measurement of expansion. *Hirsch, A., & Plantamour, E.* Arch. Sc. Ps. Nt. 38 (1870) 37-; 40 (1871) 9-.
- , — — (Hirsch and Plantamour). *Wild, H.* Arch. Sc. Ps. Nt. 40 (1871) 5-.
- Sodium. *Lucchi, G. de.* Ven. I. At. 6 (1879-80) 445-.
- and potassium and their alloy. *Hagen, E. B.* [1882] A. Ps. C. 19 (1883) 436-.
- Speculum metal for gratings, measurement of expansion. *Rogers, W. A.* Am. As. P. (1884) 116-.
- Standard 10 ft. iron bar of Indian survey and gold, silver and copper. *Prinsep, J.* Beng. J. As. S. 2 (1883) 130-.
- Steel and argentan, measurement of expansion by Fizeau's apparatus. *Ascoli, M.* Rm. R. Ac. Linc. Mm. 1 (1894) 150-.
- , Jessup's, measurement of expansion. *Morley, E. W., & Rogers, W. A.* Am. As. P. (1891) 138-; Science 2 (1895) 351.
- Stone. *Destigny, —.* J. Gén. Civ. 2 (1829) 227-.
- Stone. *Adie, A. J. B. A. Rp.* (1834) 569-; Edinb. R. S. T. 13 (1836) 554-.
- , expansion and contraction. *Bartlett, W. H. C.* Silliman J. 22 (1832) 186-.
- Sulphur. *Schrauf, A. A. Ps. C. 27* (1886) 315-.
- , selenium and tellurium. *Sprung, W.* Brux. Ac. Bl. 2 (1881) 88-.
- Thallium. *Steele, W. H.* Vict. R. S. P. 5 (1893) 193-.
- and alloys. *Omodei, D.* Rv. Sc.-Ind. 23 (1891) 25-.
- Vulcanite. *Mayer, A. M.* Am. J. Sc. 41 (1891) 54-.
- Walls of houses, action of solar heat. *Vogt, A.* Z. Bl. 15 (1879) 605-.
- Wires, telegraph, tension at different temperatures. *Barbarat, A. A.* Tél. 14 (1887) 229-.
- , —, — and "sag" at different temperatures. *Schenkel, H.* Elekttech. Z. 17 (1886) 721-.
- under tension. *Wehage, H.* Civing. 25 (1879) 619-.
- — —. *Bottomley, J. T.* Ph. Mg. 24 (1887) 314-; L. Ps. S. P. 10 (1890) 184-; Ph. Mg. 28 (1889) 94-.
- Wood. *Rittenhouse, D.* [1796] Am. Ph. S. T. 4 (1799) 29-.
- , *Joule, J. P.* [1857] R. S. P. 9 (1857-59) 3.
- , *Villari, E. N.* Cim. 25 (1887) 399-.
- , expansion and contraction. *Braddock, J.* Madras J. 7 (1838) 108-.
- Wooden rods. *Stadthagen, H.* A. Ps. C. 61 (1897) 208-.
- (Stadthagen). *Hildebrand, R. A.* Ps. C. 61 (1897) 908.
- Zinc bar, variation in length at same temperature. *Comstock, (Gen.) C. B.* Am. J. Sc. 22 (1881) 26-.
- Table of expansions of elements and some hydrocarbons. *Fizeau, H. L.* C. R. 68 (1869) 1125-.
- — — solids. *Fizeau, H. L.* Les Mondes 20 (1869) 137-.
- — — —. *MacGregor, J. G.* [1888] Cn. R. S. P. & T. 6 (1889) (Sect. 3) 3-.
- Temperatures of maximum density. *MacGregor, J. G.* [1885] N. Scotia I. Sc. P. & T. 6 (1886) 228-.

## 1420 Permanent Deformation and Thermal Hysteresis. Annealing.

- Annealing, effect on crystalline structure. *Brooke, C.* B. A. Rp. 39 (1869) (Sect. 2) 21-.
- , — — patience of copper and silver. *Howe, H. M.* Am. I. Mn. E. T. 13 (1885) 646-.
- , — — physical properties of metals. *Le Chatelier, A. C. R.* 110 (1890) 705-.
- Caoutchouc and gutta-percha, stretched, abnormalities. *Russner, J.* Carl Rpm. 18 (1882) 206-, 251-.
- Dimensions of heated solid when cooled to original temperature. *Zantedeschi, F.* Zantedeschi A. Fis. (1849-50) 29-, 223-.
- Glass, after-effects. *Wiebe, H. F.* Berl. Ak. Sb. (1884) 843-; (1885) 1021-.

- Glass, after-effects. *Weidmann, G. A. Ps. C. 29* (1886) 214-.
- , gradual alteration. *Pickering, S. U. Ph. Mg. 29* (1890) 289-.
- , permanent deformation. *Marchis, L. Bordeaux S. Sc. PV. (1896-97) 50-*, 187-; *Bordeaux S. Sc. Mm. 4* (1898) 1-; *J. de Ps. 7* (1898) 578-; 8 (1899) 198-.
- , —, theory. *Duhem, P. Bordeaux S. Sc. PV. (1896-97) 45-*.
- , secular expansion. *Volkman, P. A. Ps. C. 13* (1881) 209-.
- and steel, strain due to sudden cooling. *Barus, C., & Strouhal, V. [1896] U. S. Gl. Sv. Bil. No. 42* (1887) 98-.
- , toughened. *Curioni, G. Tor. Ac. Sc. At. 10* (1875) 365-.
- , —, *Feil, C., & Luyens, V. de. C. R. 81* (1875) 841-.
- , —, *Pocklington, H. [1875] Phm. J. 6* (1876) 251-.
- , —, *Schott, O. Dingler 216* (1875) 75-.
- , —, *Thuron, C. Gén. Civ. 5* (1884) 24-.
- , —, *Siemens, F. V. Nost. Eng. Mg. 33* (1885) 105-.
- , —, resistance to bending. *Bastie, A. de la. C. R. 92* (1881) 194-.
- , —, — shock and heat. *Bastie, A. de la. Brux. Bil. Pht. 14* (1875) 118-, 139-.
- , —, strains in. *Hoff, J. H. van't. (xn) Mbl. Nt. 6* (1876) 145-.
- Iron, cast, cooling curves. *Keep, W. J. I. & S. I. J. (1895) (No. 2) 227-*.
- , —, permanent expansion by heat. *Erman, A., & Herter, P. Pogg. A. 97* (1856) 489-.
- , changes produced by thermal treatment. *Morin, A. J. C. R. 59* (1864) 585-.
- , —, —, *Ball, E. J. I. & S. I. J. (1890) (No. 1) 85-*; (1891) (No. 1) 108-.
- and steel at a bright red heat, peculiarities in. *Newall, H. F. Ph. Mg. 24* (1887) 435-.
- —, molecular changes produced by heating and cooling. *Norris, R. [1877] R. S. P. 26* (1878) 127-.
- —, physical condition. *Hughes, D. E. I. ME. P. (1884) 36-*.
- —, yield point, effects of straining and annealing. *Unwin, W. C. R. S. P. 57* (1895) 178-.
- wire, molecular changes at low red heat. *Barrett, W. F. Ph. Mg. 46* (1873) 472-.
- Metals, change of form due to heating and partial cooling. *Clerk, H. R. S. P. 12* (1863) 453-.
- , —, —, —, — (note to Clerk's paper). *Stokes, G. G. (viii) R. S. P. 12* (1863) 471-.
- Nickel steels, annealing and permanent set. *Guillaume, C. É. C. R. 124* (1897) 1515-.
- , irreversible expansion. *Guillaume, C. É. C. R. 126* (1898) 738-.
- , properties. *Guillaume, C. É. Par. S. Ps. Sé. (1897) 120-*.
- Permanent deformations and hysteresis. *Duhem, P. Brux. Mm. Cour. 4°, 54* (1896) No. 4, 61 pp.
- modifications, general theory. *Duhem, P. Brux. Mm. Cour. 4°, 54* (1896) No. 6, 55 pp.
- Permanent modifications of sulphur. *Duhem, P. Brux. Mm. Cour. 4°, 54* (1896) No. 5, 86 pp.
- Railway axles, effect of temperature on strength. *Andrews, T. I. CE. P. 87* (1886) 840-; 94 (1888) 180-; 105 (1891) 161-.

## RECALESCENCE.

- Shand, R. Tel. J. 23* (1890) 247.
- investigation method. *Smith, F. J. Ph. Mg. 31* (1891) 433-.
- iron. *Forbes, G. [1874] Edinb. R. S. P. 8* (1875) 383-.
- , *Tomlinson, H. L. Ps. S. P. 9* (1888) 107-; *Ph. Mg. 25* (1888) 108-.
- , *Hopkinson, J. R. S. P. 45* (1889) 455-.
- , *Thomson, E. Tel. J. 24* (1889) 471.
- , *Terebin, S. J., & Rozing, B. L. Rs. Ps.-C. S. J. 26* (Ps.) (1894) 200-.
- and steel, anomalous changes during recalescence. *Svedelius, G. E. Jern-Kont. A. 51* (1897) 202-; *Ph. Mg. 46* (1896) 178-.
- and magnetism. *Hopkinson, J. R. S. P. 48* (1891) 442-.
- steel. *Newall, H. F. Ph. Mg. 25* (1888) 510-.
- , *Thomson, E. Tel. J. 24* (1889) 616-.

## RUPERT'S DROPS.

- ("Bologna phial.") *Morozzo, C. L. (conte) de. [1786] Turin Mm. Ac. 3* (1786-87) 449-.
- Snart, J. Tilloch Ph. Mg. 22* (1805) 334-.
- Biot, J. B. Par. S. Phlm. Bil. (1815) 122-*.
- Helwig, C. G. von. Gilbert A. 51* (1815) 112-.
- Merian, P. Meisner A. 1* (1824) 138-.
- (Breaking of vessel filled with water, by explosion.) *Bellani, A. A. Sc. Lomb. Ven. 5* (1835) 298-.
- Cagniard-Latour, C. Par. S. Phlm. PV. (1837) 118-*.
- (Breaking of glass vessels by explosion.) *Mazzoli, A. A. Sc. Lomb. Ven. 7* (1837) 153-.
- Vogel, A. Erdm. J. Pr. C. 77* (1859) 490-.
- Reusch, E. A. Ps. C. 130* (1867) 494-.
- Dufour, L. Arch. Sc. Ps. Nt. 84* (1869) 125-; *C. R. 68* (1869) 398-.
- Luyens, V. de. (x) Par. S. Phlm. Bil. 8* (1872) 95-; (viii) *C. R. 76* (1873) 846-.
- Thomson, W. Manch. Lt. Ph. S. Mm. & P. 2* (1889) 42-.
- Steel, effect of heat on molecular structure. *Barrett, W. F. B. A. Rp. (1875) (Sect.) 259-*.
- , —, — thermal and mechanical treatment on structure. *Sauveur, A. I. & S. I. J. (1899) (No. 2) 195-*.
- , hardening. *Howe, H. M. I. & S. I. J. (1895) (No. 2) 258-*.
- , —, *Howe, H. M., & Sauveur, A. I. & S. I. J. (1896) (No. 1) 170-*, 188-.
- , — (Howe). *Osmond, F. I. & S. I. J. (1896) (No. 1) 180-*.
- , —, *Howe, H. M. I. & S. I. J. (1897) (No. 1) 193-*.
- , — and tempering. *Roberts-Austen, W. C. [1889] Nt. 41* (1890) 11-, 32-.



- Steel, soft, brittleness produced by annealing. *Stead, J. E. I. & S. I. J.* (1898) (No. 2) 187-.
- , tempering, change in physical properties. *Kimball, A. S. Am. J. Sc.* 12 (1876) 110-.
- , —, —, —. *Rydberg, C. F.* [1887] *Stockh. Ak. Hndl. Bh.* 13 (*Afd.* 1) (1888) No. 6, 25 pp.; *Fschr. Pa.* (1887) (*Ab.* 1) 465-.
- Strain of elastic bodies, and heat. *Wittwer, W. C. Z. Mth. Pa.* 14 (1869) 478-.
- metal wires, and heat. *Haga, H.* [1881] *Amst. Ak. Vs. M.* 17 (1882) 211-; *Arch. Néerl.* 17 (1882) 261-.
- Stresses due to unequal heating. *Hopkinson, J. B. A. Rp.* 42 (1872) (*Sect.*) 51; *Mess. Mth.* 8 (1879) 168-.
- — — —, and resulting double refraction. *Rayleigh, (Lord).* *Arch. Néerl.* 5 (1900) 32-.
- Systems affected by hysteresis, theorem relating to. *Duhem, P.* *Bordeaux S. Sc. PV.* (1898-99) 68-.
- depending on one or two variables. *Duhem, P.* *Brux. Mm. Cour.* 4<sup>e</sup>, 56 (1897-98) No. 6, 198 pp.
- Wax, flexure by irregular cooling. *B., R. (vi Adds.) Nicholson J.* 4 (1803) 176-.
- Zero changes in thermometers, causes. *Crafts, J. M. C. R.* 94 (1882) 1298-; *Nass. Vr. Jb.* 38 (1885) 159.
- Zinc, sounds obtained by change of temperature. *Strehlke, F.* *Pogg. A.* 43 (1838) 405-.

### 1430 Expansion of Liquids: Pressure-Volume-Temperature Relations.

- Adiabatic volume change in solutions. *Rogóyski, K., & Tammann, G. Z. Ps. C.* 20 (1896) 1-.
- Areometer and thermometer, comparative march in same water. *Embry, —. Bb. Brit.* 33 (1806) 17-.
- Barometric readings, reduction to zero. *Viard, —. Mnpt. Mm. Ac.* 3 (1855-57) 441-.
- Density, boiling point, and coefficient of expansion, relation between. *Longinescu, G. G.* [*Bucarest S. Sc. Bl.* 5 (1896)] 56-.
- , coefficient of expansion and refractive index of ethyl ether. *Oudemans, A. C. (jun.) Amst. Ak. Vs. M.* 1 (1885) 426-; *Delft. Eo. Pol. A.* 3 (1887) 1-.
- and expansion of liquefied gases. *Andréeff, E. d'. A. C.* 56 (1859) 317-; *Lieb. A.* 110 (1859) 1-.
- of liquids existing only under high pressures. *Blümcke, A. A. Ps.* C. 23 (1884) 404-.
- Elasticity and dilatibility at high pressures. *Amagat, E. H. A. C.* 29 (1893) 505-.
- , effects. *Mensbrugge, G. van der. Brux. Ac. Bll.* 32 (1896) 270-, 418-; 36 (1898) 281-; (1899) 497-.
- Expansion coefficients, corrections. *Sainte-Claire Deville, H. C. R.* 69 (1869) 1007.
- and contraction, force. *Beck, L. C. Silliman J.* 45 (1843) 49-.
- on cooling, theory. *Havrez, P. Cuyper Rv. Un.* 10 (1861) 358-.

### EXPANSION OF LIQUIDS.

- Dalton, J. Nicholson J.* 5 (1808) 34-.
- Gay-Lussac, L. J. A. C.* 2 (1816) 180-.
- Emmett, J. B. Thomson A. Ph.* 8 (1824) 254-.
- Muncke, G. W.* [1828] *St. Pét. Mm. Sav. Étr.* 1 (1831) 249-.
- Zantedeschi, F. Majocchi A. Fis. C.* 4 (1841) 282-.
- Pierre, J. I. A. C.* 15 (1845) 325-; *C. R.* 23 (1846) 443-, 594-.
- Frankenheim, M. L. Pogg. A.* 72 (1847) 422-.
- Pierre, J. I. A. C.* 20 (1847) 5-; 31 (1851) 118-.
- Waterston, J. J. Ph. Mg.* 27 (1864) 848-.
- Avenarius, M. P.* [1876-77] (xii) *Kiev S. Nt. Mm.* 5 (1) (1878) 66-; (ix) *St. Pét. Ac. Sc. Bll.* 24 (1878) 525-; *Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 242-; *J. de Ps.* 4 (1885) 587-.
- Mendelëev, D. I. Rs. Ps.-C. S. J.* 16 (*C.*) (1884) 1-; *C. S. J.* 45 (1884) 126-.
- (*Avenarius.*) *Mendelëev, D. I. Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 282-; *Nt.* 32 (1885) 87.
- (*Mendelëev.*) *Avenarius, M. Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 400-; *J. de Ps.* 4 (1885) 587-.
- (*Avenarius.*) *Mendelëev, D. I. Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 475-; *A. C.* 2 (1884) 271-.
- Pagliani, S. Tor. Ac. Sc. At.* 20 (1885) 54-.
- Žuk, K. Rs. Ps.-C. S. J.* 17 (*Ps.*) (1885) 13-; *J. de Ps.* 5 (1886) 89.
- Grimaldi, G. P. Gz. C. It.* 17 (1887) 566-.
- Puschl, C. Wien Ak. Sb.* 96 (1888) (*Ab.* 2) 1131-.
- Pickering, S. U. Ph. Mg.* 30 (1890) 400-.
- Heilborn, E. Z. Ps. C.* 7 (1891) 367-.
- Konovalov, D. P. Rs. Ps.-C. S. J.* 23 (*C.*) (1891) 599-; *C. Ztg.* 16 (1892) 80.
- application of work done by. *Petit, A. T. A. C.* 9 (1818) 196-.
- — — —. *Sigma [Σ]. Edinb. J. Sc.* 3 (1825) 101-.
- — — —. *Tommasi, F. Les Mondes* 26 (1871) 575-.
- above their boiling points. *Drion, C. C. R.* 46 (1858) 1235-.
- — — —. *Mendelejeff, D. Lieb. A.* 119 (1861) 1-.
- formula for. *Rankine, W. J. M. Edinb. N. Ph. J.* 47 (1849) 235-.
- — mixed liquids. *Bartoli, A., & Stracciati, E. N. Cim.* 18 (1885) 111-.
- law. *Biot, J. B. Arcueil Mm. Ps.* 3 (1817) 191-.
- *Avogadro, A. Brugatelli G.* 2 (1819) 416-.
- *Waterston, J. J. Ph. Mg.* 21 (1861) 402-.
- *Potter, R. (viii) Ph. Mg.* 26 (1863) 347-.
- *Heen, P. de. Brux. Ac. Bll.* 4 (1882) 528-; 11 (1886) 545-.
- *Amagat, E. H. C. R.* 115 (1892) 919-.
- *Aubel, E. van. Arch. Sc. Ps. Nt.* 4 (1897) 201-.
- *Mendelejeff's. Luther, R. Z. Ps. C.* 12 (1893) 524-.
- , on molecular theory. *Heen, P. de. Brux. Ac. Bll.* 18 (1889) 206-.

## MEASUREMENT.

- Hällström, G. G.* Gilbert A. 14 (1803) 297-.
- Boguski, J. J.* Prace Mt.-Fiz. 1 (1888) 52-.
- Barrett, W. F.* [1889] *Dubl. S. So. P.* 6 (1888-90) 327-.
- Berget, A.* [Bucarest S. Sc. Bl. 3 (1894)] 265-.
- Guglielmo, G.* Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 2) 271-, 310-.
- change of volume in vessels during. *Boguski, J. J.* Z. Ps. C. 2 (1888) 482-.
- by dilatometer. *Knäfler, O. A.* Ps. C. 88 (1889) 136-.
- (Abbe's). *Wiedemann, G. A.* Ps. C. 88 (1889) 453-.
- Dulong and Petit's method, improvement. *Govi, G.* Nap. Rd. 24 (1885) 89-.
- microscopic. *Lehmann, O.* Z. Kr. 12 (1887) 409.
- by Mohr's balance. *Negreanu, D.* Bucarest Ac. Rom. A. 21 (Pt. admin.) (1899) 78-; Bucarest S. Sc. Bl. 9 (1900) 217-.
- photographic register. *Berget, A. C. R.* 123 (1896) 745-.
- in sealed tubes. *Golicyn, B. B.* Mosc. S. Sc. Bll. 73 (No. 2) (1891) 5; A. Ps. C. 47 (1892) 466-.
- at different pressures. *Grimaldi, G. P.* Catania Ac. Gioen. At. 18 (1885) 273-; J. de Ps. 5 (1886) 29-; 7 (1888) 72-.
- (Grimaldi). *Heen, P. de.* J. de Ps. 7 (1888) 155-.
- great pressures. *Amagat, E. H. C. R.* 105 (1887) 1120-.
- relation to critical temperature. *Mendelëev, D. I.* Rs. Ps.-C. S. J. 16 (C.) (1884) 452-; Par. S. C. Bll. 43 (1885) 108-.
- — — *Bartoli, A., & Stracciati, E.* N. Cim. 16 (1884) 91-.
- internal friction. *Heen, P. de.* Brux. Ac. Bll. 7 (1884) 248-.
- surface tension. *Heen, P. de.* Brux. Ac. Bll. 5 (1883) 505-.
- SPECIFIED LIQUIDS.**
- alcohol and carbon disulphide. *Muncke, G. W.* [1884] St. Pét. Mm. Sav. Etr. 2 (1885) 483-.
- , ether, benzene, etc., solutions. *Tammann, G., & Hirschberg, W.* Z. Ps. C. 13 (1894) 543-.
- and water mixtures. *Makins, G. H. C. S.* J. 2 (1850) 224-.
- — — *Hoh, T.* (xii) *Bamb. Nf. Gs. B.* 11 (1876) (Pt. 1, No. 4) 26 pp.; (x) A. Ps. C. 158 (1876) 334-.
- — — before solidification. *Recknagel, G.* Carl Rpm. 4 (1868) 119-.
- alcoholic solutions of salicylic, anisic and gallic acids. *Folgheraiter, G.* Ven. I. At. 6 (1880) 1095-.
- alloys in liquid state (tin and lead). *Vicentini, G., & Omodei, D.* Rm. R. Ac. Linc. Rd. 8 (1887) (Sem. 2) 235-, 294-, 321-.
- alloys in liquid state. *Vicentini, G., & Omodei, D.* Rm. R. Ac. Linc. Rd. 4 (1888) (Sem. 1) 718-, 805-, (Sem. 2) 19-, 39-, 75-.
- amalgams in liquid state. *Cattaneo, C.* Tor. Ac. Sc. At. 25 (1890) 492-; 26 (1891) 590-.
- aqueous solutions. *Forch, C. A.* Ps. C. 55 (1895) 100-.
- of glycerin. *Emo, A.* (xii) *Rv. Sc.-Ind.* 14 (1882) 357-.
- benzene and toluene. *Mureşianu, M.* Bucarest Ac. Rom. A. 16 (Pt. admin.) (1894) 112-.
- bismuth, fused. *Vicentini, G.* Rm. R. Ac. Linc. Rd. 6 (1890) (Sem. 2) 147-.
- , —, near melting point. *Vicentini, G.* Rm. R. Ac. Linc. Rd. 6 (1890) (Sem. 2) 121-.
- , —, — — — *Cattaneo, C.* Rm. R. Ac. Linc. Rd. 7 (1891) (Sem. 1) 88-.
- chloroform, ether, amyl hydride; at different pressures. *Grimaldi, G. P.* Rm. R. Ac. Linc. Rd. 2 (1886) (Sem. 1) 231-.
- diethylamine. *Oudemans, A. C. (jun.)* [1881] *Amst. Ak. Vs. M.* 17 (1882) 1-; *Arch. Néerl.* 16 (1881) 453-.
- ether. *Oudemans, A. C. (jun.)* *Amst. Ak. Vs. M.* 1 (1885) 426-; *Delft Éc. Pol. A.* 3 (1887) 1-.
- at various pressures. *Grimaldi, G. P.* Rm. R. Ac. Linc. T. 8 (1884) 292-.
- ethyl sulphonate. *Carius, L.* J. Pr. C. 110 (1870) 279-.
- gas solutions. *Nichols, E. L., & Wheeler, A. W.* [1880] *Ph. Mg.* 11 (1881) 113-.
- homologous liquids. *Mendelëeff, D.* Lieb. A. 114 (1860) 165-.
- mercury. *Hällström, G. G.* Gilbert A. 17 (1804) 107-; 20 (1805) 397-.
- *Avogadro, A.* *Brugnatelli G.* 3 (1820) 24-.
- *Crichton, J.* *Thomson A. Ph.* 7 (1824) 241-.
- *Weeg, —.* *Oken Isis* (1836) 721-.
- *Regnault, V.* C. R. 15 (1842) 391-.
- (Regnault's experiment). *Holten, C.* *Kiöb. Ov.* (1850) 87-.
- *Militzer, H.* *Pogg. A.* 80 (1850) 55-.
- *Bosscha, J.* C. R. 69 (1869) 875-.
- (Bosscha). *Regnault, V.* C. R. 69 (1869) 879-.
- (Regnault). *Bosscha, J.* *Amst. Vs. Ak.* 4 (1870) (*Nik.*) 38-; *Arch. Néerl.* 4 (1869) 187-; C. R. 69 (1869) 1185-.
- (correction of Regnault's formula). *Govi, G.* Tor. At. Ac. Sc. 6 (1870-71) 122-.
- (Regnault's experiments). *Wüllner, F. H.* A. A. A. Ps. C. 153 (1874) 440-.
- (—). *Mendelëev, D. I.* (xii) *Rs. C. Ps. S. J.* 7 (Ps.) (1875) [(Pt. 1)] 75-.
- *Broch, O. J.* *Par. Poids et Mes. Tr.* Mm. 2 (\*1868) 1-.
- (-39° to 0°). *Ayrton, W. E., & Perry, J.* L. Ps. S. P. 3 (1887) 86-; *Ph. Mg.* 22 (1886) 325-.
- *Kurz, A.* *Exner Rpm.* 22 (1886) 244-.
- , Dulong and Petit's method. *Lermantov, V. V.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 142.
- , — — — *Leduc, A.* J. de Ps. 10 (1891) 561-.

- mercury in ebonite. *Lachinov, D. A.* (xii) *Rs. Ps.-C. S. J.* 14 (*Ps.*) (1882) [(*Pt.* 1)] 202-.
- , formula. *Heen, P. de.* *Brux. Ac. Bil.* 17 (1889) 168-.
- and glass. *Bellani, A.* *Brescia Cm.* (1823) 57-; *Brugnatelli G.* 6 (1823) 20-, 217-, 274-.
- in Jena glass, between 0° and 100°. *Pernet, J., Jaeger, W., & Gumlich, E.* *Berl. Ps. Reichsanst. Ab.* 1 (1894) 102-.
- and water. *Rosenberg, B.* (xii) *Rs. C. Ps. S. J.* 9 (*Ps.*) (1877) [(*Pt.* 1)] 129-.
- metals, fused. *Vicentini, G.* [1886] *Tor. Ac. Sc. At.* 22 (1886-87) 28-.
- , —. *Vicentini, G., & Omodei, D.* [1887] *Tor. Ac. Sc. At.* 22 (1886-87) 712-; 23 (1887-88) 88-.
- methyl formate. *Kosonogov, I. I.* [1889-90] *Kiev S. Nt. Mm.* 11 (1) (1890) xlix-, lxxv-; *Rs. Ps.-C. S. J.* 22 (*Ps.*) (1890) 95; *J. de Ps.* 10 (1891) 432.
- milk. *Fleischmann, W.* *Münch. Ak. Sb.* 4 (1874) 97-.
- oils. *Preisser, F.* [1838] *J. Phm.* 25 (1839) 87-.
- , mineral. *Marek, W. J.* *Carl Rpm.* 16 (1880) 119-.
- organic compounds, solutions. *Turbaba, D.* *Fachr. Ps.* (1890) (*Ab.* 2) 274.
- phosphorus. *De Franchis, G., & Pisati, G.* *Gz. C. It.* 4 (1874) 497-.
- saline solutions. *Nicol, W. W. J.* *Ph. Mg.* 23 (1887) 385-.
- —. *Černaj, N.* *Rs. Ps.-C. S. J.* 20 (*C.*) (1888) 430-, 486-; 21 (*C.*) (1889) 73-, 176-; *C. S. J.* 56 (1889) (*Abs.*) 204-, 330-, 1101-; 58 (*Abs.*) (1890) 318-.
- — and liquid sulphur. *Despretz, C. C. R.* 7 (1838) 588-.
- — — organic liquids. *Heen, P. de.* [1879] *Brux. Mm. Cour.* 8°, 31 (1881) (*No.* 4) 51 pp.
- sea water (+8° to -3° R.). *Erman, A.* *Pogg. A.* 12 (1828) 463-.
- —. *Lenz, R.* *St. Pét. Ac. Sc. Mm.* 29 (1861) *No.* 4, 24 pp.
- — near freezing point, and statics of Polar seas. *Zöppritz, K.* [1870] *A. Ps. C.* 5 (*Erg. Bd.*) (1871) 497-.
- sodium and potassium and their alloy in liquid state. *Hagen, E. B.* [1882] *A. Ps. C.* 19 (1883) 436-.
- sulphur, fused. *Moitessier, A.* [1864] *Mntp. Mm. Ac. Sect. Sc.* 6 (1864-66) 107-.
- , —. *Pisati, G.* *Gz. C. It.* 4 (1874) 29-; *Palermo G. Sc. Nt.* 12 (1877) (*Pt.* 1) 33-.
- , —. *Scichilone, S.* *Gz. C. It.* 7 (1877) 501-.
- thallium, liquid. *Pacher, G.* *N. Cim.* 2 (1895) 143-.
- volatile liquids. *Drion, C.* *A. C.* 56 (1859) 5-.
- water. *Haüy, R. J.* *Par. S. Phlm. Bil.* 1 (1791) 75-.
- (below 42°). *Dalton, J.* [1799] *Manch. Ph. S. Mm.* 5 (1802) 373-.
- —. *Hope, T. C.* [1804] *Edinb. R. S. T.* 5 (1805) 379-.
- (0° to 20° C.). *Hällström, G. G.* *Gilbert A.* 20 (1805) 384-.
- —. *Tardy de la Brossy, —.* *Bb. Brit.* 29 (1805) 22-; 31 (1806) 305-; 41 (1809) 296-.
- water. *Eytelwein, J. A.* *Gilbert A.* 39 (1811) 231-.
- (82° to 41° F.). *T.* (vi *Adds.*) *Tilloch Ph. Mg.* 46 (1815) 417-.
- —. *Avogadro, A.* *Brugnatelli G.* 1 (1818) 351-.
- —. *Stampfer, S.* *Wien Jb. Pol. I.* 16 (1830) 1-.
- —. *Tredgold, T.* *CE. I. T.* 1 (1836) 141-.
- —. *Ritter, E.* *Gen. Mm. S. Ps.* 11 (1846) 418-.
- —. *Frankenheim, M. L.* *Pogg. A.* 86 (1852) 451-.
- —. *Alexander, J. H.* *Silliman J.* 16 (1853) 170-.
- —. *Hagen, G. H. L.* *Berl. Ab.* (1855) (*Mth.*) 1-.
- —. *Pile, W. H.* *Am. Phm. As. P.* 8 (1859) 374-.
- (80° to 100°). *Jolly, P.* *Münch. Sb.* (1864) (1) 141-.
- (below +4° R.). *Weidner, (Dr.) —.* *A. Ps. C.* 129 (1866) 300-.
- —. *Gulberg, C. M.* *Christiania F.* 12 (1869) 1-.
- —. *Morton, A.* (x) *Glaag. I. Eng. T.* 15 (1872) 135-.
- (below 4° C.). *Hément, F.* *C. R.* 77 (1873) 1219-.
- —. *Veress, V.* (xii) *Orv.-Term. Éts.* 4 (1879) (*Term. Szak*) 85-.
- —. *Volkman, P.* *A. Ps. C.* 14 (1881) 260-.
- (0° to 10°). *Bonetti, F.* *Rm. B. Ac. Linc. T.* 8 (1884) 323-.
- (4° to 0°). *Naccari, A.* *Tor. Ac. Sc. At.* 20 (1885) 969-.
- —. *Kurz, A.* *Exner Rpm.* 25 (1889) 192-.
- —. *Coppet, L. C. de.* [1891] *Laus. S. Vd. Bil.* 27 (1892) 276-.
- —. *Marek, W.* *A. Ps. C.* 44 (1891) 171-.
- —. *Mendelëev, D.* *Rs. Ps.-C. S. J.* 23 (*Ps.*) (1891) 133-; *Ph. Mg.* 33 (1892) 99-.
- —. *Chappuis, P.* *Par. Poids et Mes. PV.* (1892) 139-.
- —. *Puschl, C.* *Wien Ak. Sb.* 101 (1892) (*Ab.* 2a) 300-; *Mh. C.* (1892) 440-.
- —. *Scheel, K.* *A. Ps. C.* 47 (1892) 440-.
- —. *Amagat, E. H.* *C. R.* 116 (1893) 41-.
- —. *Stéphane de Lannoy, —.* *C. R.* 120 (1895) 866-.
- —. *Mendelëev, D.* *Rs. Ps.-C. S. J.* 29 (*Ps.*) (1897) (*App.*) 133-; *J. de Ps.* 6 (1897) 615-.
- —. *Thiesen, M., Scheel, K., & Diesselhorst, H.* *A. Ps. C.* 60 (1897) 840-.
- (0° to 40°). *Chappuis, P.* *A. Ps. C.* 63 (1897) 202-.
- , formula. *Kurz, A.* *Exner Rpm.* 21 (1885) 515-; 22 (1886) 16-.
- , —, 0° to 100° C. *Külp, L.* *Carl Rpm.* 18 (1882) 46-.
- , at high temperatures. *Waterston, J. J.* (viii) *Ph. Mg.* 26 (1863) 116-.
- and mercury. *Matthiessen, A.* [1865] *Phil. Trans.* 156 (1866) 231-.
- — saline solutions at high temperatures. *Sorby, H. C.* *Ph. Mg.* 18 (1859) 81-.
- , tables. *Scheel, K.* *Z. Instk.* 17 (1897) 331-; 18 (1898) 32.

- Expansive energy of heated water. *Rankins, W. J. M.* Ph. Mg. 26 (1863) 388-, 436-.
- liquids as introduction to terrestrial physics. *De Luc, J. A.* A. C. 48 (1803) 138-, 273-; 49 (1804) 84-, 118-, 225-; 54 (1805) 156-, 229-.
- Glaciers, curious phenomenon. *Rumford, B. (Count)*, [1803] Phil. Trans. (1804) 23-.
- De Heen's equations, experimental verification. *Grimaldi, G. P.* Rm. R. Ac. Linc. Rd. 2 (1886) (*Sem.* 1) 244-; *J. de Ps.* 7 (1888) 72-.
- — for members of homologous series. *Bartoli, A., & Stracciati, E.* N. Cim. 18 (1885) 107-.
- Impelling power of moving water, effects of changes of temperature. *Wagner, S.* Silliman J. 8 (1824) 393-.
- Laws of expansion and compressibility of water, and maximum density of water. *Amagat, E. H.* Par. S. Ps. Sé. (1893) 145-.
- Liquid state, theory. *Heen, P. de.* A. C. 5 (1885) 83-.
- Liquids, thermal behaviour. *Ramsay, W., & Young, S.* Ph. Mg. 37 (1894) 215-, 503-.
- — — *Galitzine, B.* Ph. Mg. 37 (1894) 423.
- — — *Heen, P. de.* Ph. Mg. 37 (1894) 424, 584.
- — — *Battelli, —.* Ph. Mg. 38 (1894) 245-.
- MAXIMUM DENSITY OF LIQUIDS,  
TEMPERATURE.**
- alcohol and water. *Coppet, L. de.* C. R. 115 (1892) 652-, 1346.
- alcoholic mixtures. *Rossetti, F.* Ven. At. 15 (1869-70) 1297-; *C. R.* 70 (1870) 1092-.
- aqueous methyl alcohol. *Moretto, P.* N. Cim. 6 (1897) 198-.
- solutions. *Coppet, L. C. de.* C. R. 131 (1900) 178.
- of ether. *Nort, H.* Mbl. Nt. (1895-96) 79-; *Fachr. Ps.* (1896) (*Ab.* 2) 250.
- barium chloride solutions. *Coppet, L. C. de.* C. R. 125 (1897) 538.
- saline solutions (between 100° and 150°). *Zepernick, K., & Tammann, G.* Z. Ps. C. 16 (1895) 659-.
- — — *Coppet, L. C. de.* C. R. 128 (1899) 1559-.
- — — and their freezing point. *Lussana, S., & Bozzola, G.* Ven. I. At. (1892-93) 785-.
- sea water. *Erman, A.* A. C. 38 (1828) 287-.
- — — *Hope, T. C.* [1838] Edinb. R. S. T. 14 (1840) 242-.
- sugar solutions. *Coppet, L. C. de.* A. C. 3 (1894) 268-.
- water. *Rumford, B. (Count)*. Gilbert A. 1 (1799) 436-.
- *Hällström, G. G.* Gilbert A. 17 (1804) 107-.
- *Rumford, B. (Count)*. [1805] Par. Mm. de l'I. (1806) (*Sem.* 1) 78-.
- *Tardy de la Brossey, —.* Bb. Brit. 32 (1806) 332-; 34 (1807) 193-.
- *Pictet, M. A.* Bb. Brit. 34 (1807) 118-.

- water. *Sym, G. O.* Thomson A. Ph. 9 (1817) 387-.
- *Crichton, J.* Thomson A. Ph. 5 (1823) 401-.
- *Hällström, G. G.* Stockh. Ak. Hndl. (1823) 193-; A. C. 28 (1825) 56-; Stockh. Ak. Hndl. (1824) 1-.
- *Moll, G.* Amst. N. Vh. 1 (1827) 241-.
- *Stampfer, S.* Wien Jb. Pol. I. 16 (1830) 1-.
- *Hällström, G. G.* Stockh. Ak. Hndl. (1833) 166-; *Pogg. A.* 34 (1835) 220-.
- *Joule, J. P., & Playfair, L.* [1846] Ph. Mg. 30 (1847) 41-.
- *Ezner, F.* Wien Sb. 68 (1873) (*Ab.* 2) 463-.
- *Tait, P. G.* [1883] Edinb. R. S. P. 12 (1884) 226-.
- *Vernon, H. M.* Ph. Mg. 31 (1891) 387-.
- *Coppet, L. C. de.* Laus. S. Vd. Bil. 29 (1893) 1-; A. C. 3 (1894) 246-.
- , distilled, and sea water. *Weber, L. D.* Meere Jbr. 4, 5 & 6 (1878) 1-.
- , influence of pressure. *Puschl, K.* [1875] Wien Ak. Sb. 72 (1876) (*Ab.* 2) 288-.
- , — — — *Waals, J. D. van der.* Amst. Ak. Vs. M. 11 (1877) 119-; Arch. Néerl. 12 (1877) 457-.
- , — — — *Marshall, D. H., Smith, C. M., & Omond, R. T.* Edinb. R. S. P. 11 (1882) 626-, 809-.
- , — — — (Marshall, Smith and Omond).
- *Tait, P. G.* Edinb. R. S. P. 11 (1882) 813-.
- , — — — *Grimaldi, G. P.* Gz. C. It. 15 (1885) 297-.
- , — — — *Amagat, E. H.* C. R. 104 (1887) 1159-; 116 (1893) 946-.
- , mechanical explanation. *Piarron de Mondésir, —.* C. B. 77 (1873) 1154-.
- and saline solutions. *Rossetti, F.* Ven. At. 12 (1868-67) 73-; 13 (1867-66) 1047-, 1419-; 17 (1869) 370-.
- — — —, influence of pressure. *Lussana, S.* N. Cim. 2 (1895) 238-.
- — sulphuric acid mixtures. *Kohlrausch, F.* A. Ps. C. Ergänz. 8 (1878) 675-.
- — — — —
- Molecular volumes and thermal expansion of liquids at corresponding temperatures. *Bartoli, A.* Rm. R. Ac. Linc. Mm. 19 (1884) 577-.
- Pressure, volume and temperature relations. *Grimaldi, G. P.* Z. Ps. C. 1 (1887) 550-; 2 (1888) 374-.
- , — — — — *Barus, C.* Am. J. So. 38 (1889) 407-; 39 (1890) 478-.
- , — — — — *Amagat, E. H.* C. R. 118 (1894) 566-.
- , — — — — during dissociation. *Waals, J. D. van der.* Amst. Ak. Vs. M. 15 (1880) 199-; A. Ps. C. Beibl. 4 (1880) 749-.
- Volume of liquids as function of temperature at high pressures. *Zhuk [Žuk], K. N.* [1881-96] (xii) Rs. Ps.-C. S. J. 13 (*Ps.*) (1881) 239-, 411-; 16 (*Ps.*) (1884) 304-; (xi) A. Ps. C. Beibl. 6 (1882) 86-; (xii) Kiev S. Nt. Mm. 7 (1884) lxxxvi-; 16 (1) (1899) xii-.

## 1450 Expansion of Gases

- Volume and pressure relation of solutions.  
*Tammann, G.* Z. Ps. C. 17 (1895) 620-.  
 — — temperature of bodies, especially liquids.  
*Weilermann, A.* Zür. Vjschr. 33 (1888) 37-.  
 Water, adiabatics and isothermals. *Rücker, A. W.* R. S. P. 22 (1874) 451-.  
 — — — (near maximum density point).  
*Peddie, W.* Edinb. R. S. P. 12 (1884) 983-.  
 —, expansion and contraction. *Crane, W.* Tilloch Ph. Mg. 98 (1811) 54-.  
 — — — pressure coefficient. *Amagat, E. H.* C. R. 116 (1898) 779-.  
 —, phenomenon depending on different densities. *Surdi, D.* (xii) Rv. Sc.-Ind. 7 (1875) 145-.  
 Weight thermometer, temperature compensation. *Wild, H.* St. Pét. Ac. Sc. Bll. 15 (1871) 189-; 16 (1871) 132-.  
 Work of internal expansion in liquid mixtures. *Drecker, J.* A. Ps. C. 20 (1888) 870-.

## 1450 Expansion of Gases and Unsaturated Vapours: Pressure-Volume-Temperature Relations. (See also Chemistry 7160.)

- Adiabatic relation. *Moutier, J.* A. C. 7 (1876) 318-.  
 — —. *Antoine, C.* C. R. 105 (1887) 1242-.  
 — —, ether. *Ramsay, W., & Perman, E. P.* R. S. P. 49 (1891) 447.  
 — —, —. *Perman, E. P., Ramsay, W., & Rose-Innes, J.* [1896] Phil. Trans. (A) 189 (1897) 167-.  
 — —, modification for gaseous jet. *Parenty, H.* C. R. 113 (1891) 791-.  
 Aëriiforms, law of volume extended to dense bodies. *Macvicar, J. G.* Edinb. R. S. T. 23 (1864) 581-.  
 Air and coal gas, explosion constants of mixtures. *Witz, A.* C. R. 100 (1885) 1131-.  
 —, composition, conflicting results. *Leduc, A.* C. R. 111 (1890) 262-.  
 —, compressed, efflux. *Salcher, P., & Whitehead, J.* [1888] Wien Ak. Sb. 98 (1890) (Ab. 2a) 267-.  
 — —, new phenomena. *Armellini, T.* Rm. At. N. Linc. 25 (1872) 94-.  
 —, compression in air-bubble under water. *Tait, P. G.* Edinb. R. S. P. 5 (1866) 563-.  
 —, condensation and rarefaction, applications. *Fränkel, W.* Dresden Sb. Isis (1868) 42-.  
 —, heated, slightly compressed, use. *Miller, J. A.* (vi Add.) Am. I. T. (1863-64) 586-.  
 —, Pascal's experiments on weight. *Thurot, C. J. de Ps.* 1 (1872) 267-.  
 — pressure variometer, Hefner-Alteneck. *Weber, L.* [1896] Schl.-Holst. Nt. Vr. Schr. 11 (1898) 9.  
 — pump, limit of rarefaction. *Deventer, J. G. van.* Batav. Ntk. Ts. 56 (1897) 183-.  
 — —, variable pressure under piston. *Golicyn, (Prince) B. B.* St. Pét. Ac. Sc. Bll. 5 (1896) xi-; 7 (1897) 409-.

## Boyle's Law 1450

- Atmosphere, density and pressure. *Speer, T. C.* Tilloch Ph. Mg. 33 (1809) 417-.  
 —, height. *Minary, E.* [1889] Doubs S. Mm. 4 (1890) 221-.  
 —, volume. *Hill, G. W.* Des Moines Anal. 4 (1877) 97-.  
 Avogadro's law. *Blaserna, P.* Gz. C. It. 1 (1871) 64-.  
 — —. *Leduc, A.* C. R. 124 (1897) 265-.  
 — —, analogue. *Groshans, J. A.* Mon. Sc. 24 (1882) 1027-.  
 Balloon problem: expanding gas. *Paradox (Pseud.).* Science 19 (1892) 136-.  
 Barothermoscope and absolute millesimal scale. *Salomon, F.* Z. Angew. C. (1894) 687-.

### BOYLE'S (OR MARIOTTE'S) LAW.

- Arnim, L. A. von.* Gilbert A. 2 (1799) 238-.  
*Ampère, A. M.* [1814] A. C. 94 (1815) 145-.  
*Örsted, H. C., & Suenson, (Capt.)* —. Kiöb. Ov. (1824-25) 13-.  
*Örsted, H. C.* Schweigger J. 45 (=Jb. 15) (1825) 352-.  
*Esley, T.* Thomson Rc. 4 (1836) 336-.  
*Regnault, V.* Bb. Un. Aroh. 2 (1846) 66-.  
*Hunt, E. B.* Silliman J. 9 (1850) 412-.  
*Wilbraham, H.* Camb. and Dubl. Mth. J. 6 (1851) 167-.  
 (at pressure below an atmosphere.) *Siljeström, P. A.* [1873-74] (xi) Stockh. Ak. Hndl. Bh. 2 (1873-75) No. 1, 54 pp., No. 10, 21 pp. (Siljeström.) *Mendelejeff, D. I.* Berl. B. 7 (1874) 1339-.  
 (Mendelejeff.) *Siljeström, P. A.* Berl. B. 8 (1875) 576-.  
 (Siljeström.) *Mendelejeff, D. I.* Berl. B. 8 (1875) 744-.  
*Gosiewski, W.* Par. T. Nauk Śc. Pam. 9 (\*1877) Art. 4, 4 pp.; 11 (\*1879) Art. 6, 3 pp.; Z. Mth. Ps. 22 (1877) 336-.  
*Mendelejeff, D. I.* Nt. 15 (1877) 455-, 498-.  
 apparatus. *Volpicelli, P.* Rm. At. 10 (1856-57) 181-, 393-, 430-; 11 (1857-58) 55-, 133-, 206-; 12 (1858-59) 28-, 76-, 276-.  
 —. *Hagen, E. B.* (xii) Z. Instk. 2 (1882) 252-.  
 —. *Thomas, B. F.* Am. As. P. (1883) 136-.  
 —. *Piarron de Mondésir,* —. Par. Ing. Civ. Mm. (1887) (Pt. 1) 267-.  
 —. *Rheam, W.* Nt. 49 (1893-94) 433.  
 deduced from theoretical principles. *Mayer, J. T.* [1824] Gött. Cm. 6 (1823-27) 3-.  
 and definition of density. *Uylenbroek, P. J.* Amst. I. (1841) 114-.  
 deviations. *Kolk, H. W. S. van der.* Pogg. A. 116 (1862) 429-.  
 —. *Amagat, E. H.* C. R. 68 (1869) 1170-; Aroh. Sc. Ps. Nt. 35 (1869) 189-.  
 —. *Budde, E.* J. Pr. C. 9 (1874) 30-.  
 —. *Winkelmann, A. A.* A. Ps. C. 5 (1878) 92-.  
 — at low pressures (oxygen). *Bohr, C.* [1885] Kjöb. Dn. Vd. Selak. Skr. 2 (1881-86) 401-; A. Ps. C. 27 (1886) 459-.  
 effect of moisture. *Dubrunfaut,* —. C. R. 68 (1869) 1262-.

at high temperature. *Puschl, C.* Wien Ak. Sb. 97 (1889) (*Ab. 2a*) 142-; Mh. C. (1888) 98-.  
 — low pressure. *Fuchs, F.* A. Ps. C. 85 (1888) 430-.  
 — — —. *Sutherland, W.* Ph. Mg. 43 (1897) 11-.  
 — — —. *Battelli, —.* Rv. Sc.-Ind. 82 (1900) 210-.  
 pressure less than an atmosphere. *Ven, E. van der.* A. Ps. C. 88 (1889) 302-; Haarl. Ms. Teyl. Arch. 3 (1892) 349-, 589-.

Calorific and expansive properties of elastic fluids. *Reech, F. C. R.* 46 (1858) 84-; 56 (1863) 1240-; 57 (1863) 505-.  
 Cartesian diver. *Bauer, K. L.* A. Ps. C. (*Erg.* 6) (1874) 332-.  
 — — —. *Rebenstorff, H.* Dresden Isis Sb. (1900) (*Ab.*) 3-.

CHANGE OF TEMPERATURE ACCOMPANYING CHANGE OF VOLUME.

*Dalton, J.* [1800] Manch. Ph. S. Mm. 5 (1802) (*Pt.* 2) 515-.  
*Wrede, E. F.* Gilbert A. 44 (1813) 111-.  
*Navier, C. L. M. H.* Par. S. Phlm. Bll. (1820) 97-.  
*Henry, J.* [1825] Alb. I. T. 1 (\*1830) (*Pt.* 2) 36.  
*Ivory, J.* Ph. Mg. 1 (1827) 89-, 165-.  
 (*Ivory.*) *Meikle, H.* QJ. Sc. (1828) (*Pt.* 2) 124-.  
 (*Meikle.*) *Ivory, J.* Ph. Mg. 4 (1828) 321-.  
 (*Ivory and Meikle.*) *Anon.* (vi 1064) QJ. Sc. (1829) (*Pt.* 1) 277-.  
*Ewart, P.* Ph. Mg. 5 (1829) 247-.  
*Joule, J. P.* [1844] Ph. Mg. 26 (1845) 369-.  
*Rankine, W. J. M.* Edinb. N. Ph. J. 51 (1851) 128-.  
*Asmann, C.* Pogg. A. 85 (1852) 1-.  
*Koosen, J. H.* Pogg. A. 89 (1853) 437-.  
*Cazin, A.* A. C. 66 (1862) 206-.  
*Dupré, A.* A. C. 67 (1863) 359-; C. R. 58 (1864) 539-.  
*Cantoni, G.* Mil. I. Lomb. Rd. 4 (1867) 135-.  
*Moutier, J.* C. R. 68 (1869) 95-; 69 (1869) 1137-.  
*Regnault, V.* C. R. 69 (1869) 780-; Par. Ac. Sc. Mm. 37 (*pt.* 2) (1870) 579-.  
*Heath, (Rev.) J. M.* Ph. Mg. 39 (1870) 288-.  
*Regnault, V.* A. C. 24 (1871) 342-.  
*Jamin, J., & Richard, —.* C. R. 75 (1872) 105-, 453-.  
*Thurston, R. H.* Franklin I. J. 67 (1874) 267-.  
*Heath, (Rev.) J. M.* Ph. Mg. 4 (1877) 14-.  
*Schmidt, G.* Dingler 238 (1880) 267-, 361-.  
*Tait, P. G.* [1881] Edinb. R. S. P. 11 (1882) 51-, 217-.  
*Rivière, C.* J. de Ps. 3 (1884) 473-.  
*Natanson, E.* Kosmos (Lw.) 12 (1887) 415-; A. Ps. C. 31 (1887) 502-.  
*Hazen, H. A.* Science 19 (1892) 150-.  
*Witkowski, A.* [1898] Krk. Ak. (*Mt.-Prz.*) Rz. 15 (1899) 247-; Cro. Ac. Sc. Bll. (1898) 282-.

*Waals, J. D. van der.* Amst. Ak. Vs. 8 (1900) 441-; Amst. Ak. P. 2 (1900) 379-.

CHARACTERISTIC EQUATION.

*Davy, (Sir) H.* R. I. J. 1 (1802) 269-.  
*Herapath, J.* Thomson A. Ph. 8 (1816) 56-.  
*Meikle, H.* QJ. Sc. 1 (1829) 56-.  
*Potter, R.* Ph. Mg. 6 (1853) 161-; 23 (1862) 52-.  
*Dupré, A.* C. R. 59 (1864) 905-.  
*Heath, J. M.* Ph. Mg. 39 (1870) 347-.  
*Gladbach, P.* A. Ps. C. 145 (1872) 318-.  
*Mendelejeff, D. I.* Berl. B. 7 (1874) 1455.  
*Kuhn, M.* Carl Rpm. 11 (1875) 327-.  
*Mendelejeff, D. I.* C. R. 62 (1876) 412-.  
*Waals, J. D. van der.* Amst. Ak. Vs. M. 15 (1890) 199-; A. Ps. C. Beibl. 4 (1890) 749-.  
*Biehringer, (Dr.) —.* Z. Mth. Ps. 26 (1881) 377-.  
*Gouilly, A.* C. R. 93 (1881) 722-, 1134-.  
*Amagat, E. H.* C. R. 94 (1882) 847-; A. C. 28 (1888) 500-.  
*Thiesen, M.* A. Ps. C. 24 (1885) 467-.  
*Natanson, L.* C. R. 109 (1889) 890-.  
*Antoine, C.* C. R. 112 (1891) 284-.  
*Proell, R.* Dresden Isis Sb. (1891) 29-.  
*Weinstein, B.* A. Ps. C. 54 (1895) 544-.  
*Waals, J. D. van der.* [1896] Amst. Ak. Vs. 5 (1897) 150-; Fschr. Ps. (1896) (*Ab.* 2) 199-.  
*Thiesen, M.* A. Ps. C. 63 (1897) 329-.  
*Woodward, C. M.* St. Louis Ac. T. 9 (1899) 53-.  
*Guye, P. A., & Friderich, L.* Arch. Sc. Ps. Nt. 9 (1900) 505-.  
 carbon dioxide. *Clausius, R.* [1879] A. Ps. C. 9 (1880) 337-.  
 — — —. *Sarrau, E.* C. R. 101 (1885) 1145-.  
 — — —. *Walckenaer, C.* A. Mines 4 (1893) 420-.  
 — — —. Rankine's form. *Turazza, D.* Ven. At. (1859-60) 53-.  
 corresponding states. *Waals, J. D. van der.* Amst. Ak. Vh. 20 (1880) (*Nos.* 6 & 7) 82 + 11 pp.; A. Ps. C. Beibl. 5 (1881) 27-, 250-; Amst. Ak. Vh. 21 (1881) No. 5, 10 pp.; A. Ps. C. 5 (1881) 567-.  
 — — —. *Natanson, L.* C. R. 109 (1889) 855-.  
 form of Clausius. *Sarrau, E.* C. R. 101 (1885) 941-.  
 — — —. *Riecke, E.* Gött. Nr. (1894) 285-.  
 — derived from Joule-Thomson effect. *Schiller, N.* A. Ps. C. 40 (1890) 149-.  
 — of van der Waals. *Kraevič, K.* Rs. Ps.-C. S. J. 19 (*Ps.*) (1887) 1-; J. de Ps. 7 (1888) 271-.  
 — — — —. *Sonin, N. J.* [1889] Vars. S. Nt. Tr. (1889-90) (*C. R., Ps. C.*) No. 5, 9-, No. 6, 1-; Fschr. Ps. (1890) (*Ab.* 2) 247-.  
 — — — —. *Korteweg, D. J.* Nt. 45 (1892) 152-, 277-.  
 — — — —. *Boltzmann, L.* Amst. Ak. Vs. 7 (1899) 477-; Amst. Ak. P. 1 (1899) 398-.  
 — — — — (Boltzmann). *Waals, J. D. van der.* Amst. Ak. Vs. 7 (1899) 537-; Amst. Ak. P. 1 (1899) 468-.

## 1450 Compressibility of Gases

- form of van der Waals, corresponding states. *Young, S.* [1892-93] *L. Ps. S. P.* 11 (1892) 233-; 12 (1894) 447-; *Ph. Mg.* 33 (1892) 153-; 37 (1894) 1-.
- — — — —. *Meslin, G.* *C. R.* 116 (1893) 185-.
- — — — —, modified. *Boltzmann, L., & Mache, —.* *Wien An.* 86 (1899) 87-.
- — — — —, physical meaning of 'b.' *Heilborn, E.* *Exner Rpm.* 27 (1891) 369-.
- hydrogen. *Antoine, C.* *C. R.* 110 (1890) 1253-.
- isopentane. *Young, S.* *L. Ps. S. P.* 13 (1895) 602-.
- nitrogen. *Sarrau, É.* *C. R.* 110 (1890) 890-.
- , *Antoine, C.* *C. R.* 110 (1890) 1122-.
- rarefied gases. *Baly, E. C. C., & Ramsay, W. L.* *S. P.* 13 (1895) 187-; *Ph. Mg.* 38 (1894) 301-.
- various vapours. *Antoine, C.* *C. R.* 110 (1890) 632-; 114 (1892) 1177-.
- water vapour. *Antoine, C.* *C. R.* 114 (1892) 162-.
- — —. *Manaira, A.* *N. Cim.* 1 (1895) 365-.
- — —. *Tumlirz, O.* *Wien Ak. Sb.* 108 (1899) (Ab. 2a) 1058-.

Coefficients of increase of elasticity and volume in gases, independence. *Sluginov, N. P.* *Kazan S. Nt. (Ps.-Mth.)* P. 5 (1887) 169-.

Cohesion in relation to Carnot's function. *Croll, J. B. A. Rp.* (1862) (pt. 2) 21.

### COMPRESSIBILITY OF GASES.

- Burckhardt, J. K.* *Zach M. Cor.* 9 (1804) 308-.
- Ivory, J.* *Tilloch Ph. Mg.* 66 (1825) 3-.
- Örsted, H. C.* [1825] *Edinb. J. Sc.* 4 (1826) 224-.
- Regnault, V.* *C. R.* 23 (1846) 787-.
- Avogadro, A.* [1851] *Tor. Mm. Ac.* 13 (1853) 171-.
- Regnault, V.* *R. S. P.* 6 (1858) 298-.
- Akin, K.* [1866] (xii) *Mag. Tud. Ak. Étk. (Term.)* 1 (1870) (No. 6) 7 pp.
- Mendelyeev, D. I.* (xii) *Rs. C. S. J.* 4 (1872) 309-.
- Hemilian, W., & Mendelejeff, D.* *Berl. B.* 9 (1876) 1841-.
- Cailletet, L.* *C. R.* 88 (1879) 61-.
- Moutier, J.* *Par. S. Phlm. Bll.* 3 (1879) 184-.
- Bouty, E.* *J. de Ps.* 9 (1880) 12-.
- Roth, F. A.* *Ps. C.* 11 (1880) 1-.
- Sarrau, É.* *C. R.* 94 (1882) 639-, 718-, 845-.
- Amagat, E. H.* *A. C.* 28 (1883) 456-.
- Puschl, C.* *Wien Ak. Sb.* 96 (1888) (Ab. 2) 1028-.
- Zilov, P. A.* [1891] *Vars. S. Nt. Tr.* (1891-92) (*C. R., Ps. C.*) No. 6, 10-; *Fschr. Ps.* (1891) (Ab. 2) 248-.
- about atmospheric pressure. *Leduc, A.* *C. R.* 123 (1896) 743-.
- — —. *Leduc, A., & Sacerdote, P.* *C. R.* 125 (1897) 297-.

## Specified Gases 1450

- about atmospheric pressure. *Leduc, A.* *C. R.* 125 (1897) 646-, 838-.
- and expansion. *Amagat, E.* *C. R.* 71 (1870) 67-; 73 (1871) 183-.
- — —, new method. *Amagat, E. H.* *C. R.* 111 (1890) 871-.
- during explosions. *Vieille, —.* *Par. S. Pa. Sé.* (1891) 73-.
- at high pressure. *Cailletet, L.* *C. R.* 70 (1870) 1131-.
- — —. *Amagat, E. H.* *C. R.* 87 (1878) 432-; 88 (1879) 336-; 89 (1879) 437-; *A. C.* 19 (1880) 345-; *C. R.* 107 (1888) 522-.
- — — temperatures. *Blaserna, P.* *C. R.* 69 (1869) 132-.
- low pressure. *Mendelejeff, D. I., Hemilian, W., & Boguski, J. G.* *Berl. B.* 9 (1876) 1312.
- relation to mechanical theory of heat. *Dupré, A.* *A. C.* 1 (1864) 168-.
- and vapours. *Antoine, —.* *C. R.* 102 (1886) 863-.

### Specified Gases.

- air. *Antoine, C.* *C. R.* 108 (1889) 141-.
- and carbon dioxide. *Blaserna, P.* [1865] *Palermo G. Sc. Nt.* 1 (1866) 51-.
- — — — —. *Amagat, E. H.* *A. C.* 28 (1883) 464-.
- — — — —, under low pressure, at high temperature. *Amagat, E. H.* *C. R.* 93 (1881) 306-.
- — — — — mixtures. *Lala, U.* *C. R.* 111 (1890) 819-.
- as gaseous mixture. *Amagat, E. H.* *C. R.* 127 (1898) 88-.
- , up to high pressures. *Antoine, C.* *C. R.* 110 (1890) 335-.
- , hydrogen and carbon dioxide at low pressure. *Amagat, E. H.* *A. C.* 28 (1883) 480-.
- and hydrogen at high temperatures. *Amagat, E. H.* *C. R.* 75 (1872) 479-; *A. C.* 28 (1873) 274-.
- — — — — mixtures. *Lala, U.* *C. R.* 112 (1891) 426-.
- carbon dioxide. *Antoine, C.* *C. R.* 108 (1889) 896-.
- cyanogen. *Chappuis, J., & Rivière, C.* *C. R.* 104 (1887) 1433-.
- ethylene. *Waals, J. D. van der.* *Amst. Ak. Vs. M.* 15 (1880) 426-; *A. Ps. C. Beibl.* 4 (1880) 704-.
- hydrogen. *Wroblewski, S. von.* *Wien Ak. Sb.* 97 (1889) (Ab. 2a) 1321-; *Mh. C.* (1883) 1067-.
- nitrogen. *Amagat, E. H.* *C. R.* 95 (1882) 638-.
- — —. *Sarran, —.* *Bordeaux S. Sc. PV.* (1897-98) 158-.
- , up to high pressures. *Antoine, C.* *C. R.* 110 (1890) 131-.
- oxygen. *Amagat, E. H.* *C. R.* 91 (1880) 812-.
- at low pressures. *Campetti, A.* *Tor. Ac. Sc. At.* 31 (1895) 52-.

- Compression apparatus. *Fonseca Benevides, F. da.* *Lisb. J. Sc. Mth.* 3 (1871) 236-.
- — — *Guidi, F.* *Rm. N. Linc. At.* 39 (1886) 258-.
- — — *Hartwich, A.* *Königsb. Schr.* 32 (1891) (Sb.) 51-.
- of mixed gases from electrolysis of water in closed vessel. *Bouvet, A.* *Les Mondes* 44 (1877) 296-; *C. R.* 85 (1877) 681-.
- Concentration of gases. *Krönig, A.* *A. Ps. C.* 123 (1864) 299-.
- Constant "a" of diameters, calculation. *Mathias, E.* *C. R.* 128 (1899) 1389-.
- R in theory of gases. *Sandrucci, A. G.* *Mt.* 25 (1887) 73-.
- Dalton's law. *Guglielmo, G., & Musina, V.* *Rv. Sc.-Ind.* 19 (1887) 185-.
- — — *Galitzine, B.* *A. Ps. C.* 41 (1890) 588-, 770-.
- — — (Galitzine). *Margules, M.* *A. Ps. C.* 42 (1891) 348-.
- Densities, molecular volumes, compressibility and expansion of gases at different temperatures. *Leduc, A.* *Par. S. Ps. Sé.* (1897) 152-.
- Density of gases, correction of Regnault's values. *Crafts, J. M.* *C. R.* 106 (1888) 1662-.
- — — easily liquefiable. *Leduc, A.* *C. R.* 125 (1897) 571-.
- Elasticity of air. *Rodig, —.* *Voigt Mg.* 4 (1802) 700-.
- — — *Stewart, B.* *Phil. Trans.* (1863) 425-.
- — — at low pressure. *Mendelejeff, D. I., & Kirpitschhoff, M.* *St. Pét. Ac. Sc. Bll.* 19 (1874) 469-.
- — — — — *Amagat, E. H.* *C. R.* 82 (1876) 914-.
- — carbon dioxide. *Rankine, W. J. M.* *Ph. Mg.* 15 (1858) 303-.
- and density of rarefied gas by velocity of sound. *Kraevič, K.* *Rs. Ps.-C. S. J.* 16 (Ps.) (1884) 307-; *J. de Ps.* 6 (1887) 201-.
- — — — — (Kraevič). *Stolětov, A. G.* *Rs. Ps.-C. S. J.* 16 (Ps.) (1884) 407-; *J. de Ps.* 6 (1887) 203-.
- — — — — (Stolětov). *Kraevič, K.* *Rs. Ps.-C. S. J.* 17 (Ps.) (1885) 25-; *J. de Ps.* 6 (1887) 201-.
- — — — — (Kraevič). *Stolětov, A. G.* *Rs. Ps.-C. S. J.* 17 (Ps.) (1885) 52-; *J. de Ps.* 6 (1887) 203-.
- — — — — *Kraevič, K.* *Rs. Ps.-C. S. J.* 17 (Ps.) (1885) 335-; *A. Ps. C. Beibl.* 11 (1887) 15-.
- — — — — (Kraevič). *Stolětov, A. G.* *Rs. Ps.-C. S. J.* 18 (Ps.) (1886) 65-; *A. Ps. C. Beibl.* 11 (1887) 18-.
- — — — — (Stolětov). *Kraevič, K.* *Rs. Ps.-C. S. J.* 18 (Ps.) (1886) 129-; *J. de Ps.* 6 (1887) 201-.
- dilatibility of gases at high pressures. *Amagat, E. H.* *A. C. R.* 29 (1893) 68-.
- of gaseous mixtures. *Lala, U.* *Toul. Fac. Sc. A.* 5 (1891) G, 95 pp.
- Elasticity of gases. *Fontana, F.* *Verona S. It. Mm.* 1 (1782) 83-.
- — — *Phillips, R.* (vi *Adds.*) *Ph. Mg.* 24 (1844) 354.
- — — *Regnault, V.* *Pogg. A.* 67 (1846) 584-.
- — — (rarefied). *Amagat, E. H.* *C. R.* 95 (1882) 281-.
- — — *Puschl, C.* *Wien Ak. Sb.* 101 (1892) (*Ab. 2a*) 541-; *Mh. C.* (1892) 635-.
- — — and vapours. *Holtzmann, C. H. A.* *Taylor Sc. Mm.* 4 (1846) 189-.
- — vapours. *Rankine, W. J. M.* *Ph. Mg.* 29 (1865) 283-.
- Equilibrium of column of air, and atmospheric temperature gradient. *Robertson, D.* *Glasg. Ph. S. P.* 81 (1900) 145-.

## EXPANSION OF GASES.

- Guyton de Morveau, L. B.* *A. C.* 1 (1789) 256-.
- Dalton, J.* [1801] *Manch. Ph. S. Mm.* 5 (1802) 535-.
- (Dalton.) *Gilbert, L. W.* *Gilbert A.* 14 (1803) 266-; 15 (1803) 25-.
- (—) *Parrot, G. F.* *Gilbert A.* 17 (1804) 82-; 25 (1807) 434-.
- Paoli, D.* *Brugnatelli G.* 4 (1811) 187-.
- Biggs, M.* *Thomson A. Ph.* 6 (1823) 415-.
- Davy, (Sir) H.* *Phil. Trans.* (1823) 204-.
- Biggs, M.* *Thomson A. Ph.* 7 (1824) 133-.
- Delarive, A.* *Bb. Un.* 36 (1841) 409-.
- Magnus, G.* *Berl. Ab.* (1841) 59-.
- Regnault, V.* *C. R.* 13 (1841) 1077-.
- Majocchi, G. A.* (vi *Adds.*) *Majocchi A. Fis. C.* 7 (1842) 268-.
- Regnault, V.* *A. C.* 4 (1842) 5-; 5 (1842) 52-; *C. R.* 14 (1842) 204-, 595-.
- Petrie, W.* *Edinb. N. Ph. J.* 51 (1851) 120-.
- Potter, R.* *Ph. Mg.* 28 (1864) 271-.
- Cazin, A.* *C. R.* 69 (1869) 400-; *A. C.* 20 (1870) 251-.
- Dubrunfaut, —.* *C. R.* 70 (1870) 754-.
- Amagat, E. H.* *Arch. Sc. Ps. Nt.* 40 (1871) 820-.
- Crona, A.* [1872] *Mntp. Mm. Ac. Sect. Sc.* 8 (1872-75) 81-.
- Amagat, E. H.* *A. C.* 29 (1873) 246-.
- Jolly, P. von.* *A. Ps. C. Jubelbd.* (1874) 82-.
- Carhart, H. S.* *V. Nost. Eng. Mg.* 12 (1875) 207-.
- Robinson, S. W.* *V. Nost. Eng. Mg.* 13 (1875) 435-.
- Mendelejeff, D. I., & Kajander, N.* *Berl. B.* 9 (1876) 1311.
- Lucas, F.* *C. R.* 103 (1886) 1251-.
- Puschl, P. C.* [1888-89] *Wien Az.* 25 (1889) 43-; *Wien Ak. Sb.* 98 (1890) (*Ab. 2a*) 757-, 1337-.
- Amagat, E. H.* *C. R.* 115 (1892) 771-.
- Leduc, A.* *C. R.* 125 (1897) 768-, 838.
- Morley, E. W., & Miller, D. C.* *Am. As. P.* (1897) 123.



1450                      **Expansion of Gases and Unsaturated Vapours**                      1450

Berthelot, D. C. R. 128 (1899) 498-  
 moist. Amagat, E. H. C. R. 74 (1872) 1299-  
 and vapours. Gay-Lussac, L. J. A. C. 43 (1802) 137-  
 — (correction of Gay-Lussac's results).  
 Gilbert, L. W. Gilbert A. 12 (1803) 396-  
 —, law. Prony, R. de. Par. Éc. Pol. J. 2<sup>e</sup> cah. (1795) 24-.

SPECIFIED GASES.

air. Flaugergues, H. J. de Ps. 77 (1813) 273-  
 —. Gay-Lussac, L. J., & Welter, J. J. A. C. 19 (1821) 436-  
 —. Meikle, H. Ph. Mg. 11 (1832) 243-  
 —. Prout, W. B. A. Rp. (1831-32) 566-  
 —. Rudberg, F. Stockh. Ak. Hndl. (1837) 140-  
 —. Regnault, V. C. R. 15 (1842) 391-  
 —. Mendelejeff, D. I. C. R. 81 (1875) 1094-; 1182-; Arch. Sc. Ps. Nt. 55 (1876) 233-; (xii) Rs. C. Ps. S. J. 8 (Ps.) (1876) [(Pt. 1)] 19-, 95-  
 —. Mendelejeff, D. I., & Kajander, N. C. R. 82 (1876) 450-  
 —. Radau, R. Mon. Sc. 18 (1876) 643-  
 —. Usov, S. A. (xii) Rs. C. Ps. S. J. 8 (Ps.) (1876) [(Pt. 1)] 207-  
 —. Leonhardt, —. [1889] Exner Rpm. 27 (1891) 253-  
 —. Nyrén, M. Pulk. Obs. Ph. 2 (1896) (8).  
 —, and compressibility. Witkowski, A. Krk. Ak. (Mt.-Prz.) Rz. 3 (1891) 343-; 12 (1896) 128-; Ph. Mg. 41 (1896) 288-; 42 (1896) 1-  
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- — — and affinity. *Avogadro, A.* [1823-25] *Tor. Mm. Ac.* 28 (1824) 1-; 29 (1825) 79-; *Brugnatelli G.* 8 (1825) 432-.
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- , return of mercury-thread. *Neesen, F.* [1883] (xii) Berl. Ps. Gs. Vh. 2 (1884) 29-.
- for lecture purposes. *Baker, T. J.* B. A. Rp. (1886) 525-.
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- thermometers. *Berthelot, M. J.* de Ps. 2 (1873) 18-.
- Calorimetry at constant temperature. *Arsonval, A. d'.* C. R. 106 (1888) 1225-.
- , experimental error. *Pickering, S. U. L.* Ps. S. P. 8 (1887) 1-; Ph. Mg. 21 (1886) 324-.
- of iron at high temperatures. *Pionchon, —.* C. R. 102 (1886) 1454-; A. C. 11 (1887) 33-.
- metals at high temperatures. *Pionchon, —.* C. R. 102 (1886) 675-; 103 (1886) 1122-; A. C. 11 (1887) 33-.
- Condensation method. *Joly, J.* R. S. P. 41 (1887) 352-.
- Cooling method. *Regnault, V.* A. C. 9 (1843) 322-.
- — — *Bartoli, A.* Mil. I. Lomb. Rd. 28 (1895) 787-.
- Correction for cooling. *Berthelot, M. J.* de Ps. 2 (1873) 345-; 19 (1881) 79-.
- — — *Bartoli, A.*, & *Stracciati, E.* Catania Ac. Gioen. Bll. 26-28 (1892) 4-.
- radiation. *Holman, S. W.* Am. Ac. P. 31 (1896) 245-.
- Differential method. *Joly, J.* Nt. 30 (1884) 361.
- Electric current, use. *Jamin, J.* C. B. 70 (1870) 657-.
- Electrocalorimetry. *Stroud, W.*, & *Gee, W. W. H.* Elect. 21 (1888) 705-.
- *Evershed, S.*, & others. Elect. 21 (1888) 773 et seq.; 22 (1889) 24.
- Heat of combustion. *Stohmann, F.*, & *Rechenberg, C. von.* Lndw. Jb. 13 (1884) 513-.
- , quantity, sensitive and convenient method of measuring. *Lussana, S.* Rv. Sc. [Ind.] 30 (1898) 176-.
- Saturated liquids, complete study. *Mathias, E.* Toul. Fac. Sc. A. 10 (1896) E, 52 pp.
- Specific heat. *Canestrini, E.* [1884] Padova S. Sc. At. 9 (1885) 5-.
- Thermochemical work at high temperature, apparatus. *Joannis, —.* Bordeaux S. Sc. Mm. 4 (1888) xxiv-.
- Thermoscope, double, for thermal experiments. *Looser, —.* Frkf. a. M. Ps. Vr. Jbr. (1893-94) 42-.
- Water, anomalies. *Guillaume, C. É.* Par. S. Ps. Sé. (1898) 66\*-.

## Specific Heats 1620

Water equivalent of thermometers used in specific heat determinations. *Sozzani, A.* N. Cim. 5 (1897) 135-.

## 1620 Specific Heats of Solids and Liquids.

(See also Chemistry 7220.)

- Avogadro, A.* A. C. 55 (1833) 80-; 57 (1834) 118-.
- Delarive, A.* C. R. 10 (1840) 828-.
- Cerruti, V.* Rm. R. Ac. Linc. T. 1 (1877) 136-.
- Moriso, —.* C. R. 90 (1880) 814-.
- Bohn, C.* Z. Mth. Ps. 28 (1883) 83-.
- Demonstration of inequalities. *Lachinov, D. A.* (xii) Rs. Ps.-C. S. J. 12 (Ps.) (1880) [(Pt. 1)] 131-.
- Function h. *Nikolaev, V. V.* (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [(Pt. 1)] 61-.

### MEASUREMENT.

- Joule, J. P.* [1845] Manch. Ph. S. Mm. 7 (1846) 559-.
- Thoulet, M. J. O.*, & *Lagarde, H.* (xii) Fr. S. Mn. Bll. 5 (1882) 179-.
- Moriso, —.* C. B. 97 (1883) 1428-.
- Louguinine, W.* Z. Instk. 16 (1896) 129-, 192.
- cooling method. *Neesen, —.* D. Nf. Tbl. (\*1880) 135-.
- electric method. *Joule, J. P.* [1847] Manch. Ph. S. Mm. 8 (1848) 375-.
- — — *Huntly, G. N.* Nt. 36 (1887) 438-.
- — — *Stroud, W.* Nt. 36 (1887) 483.
- — — *Pfaundler, L.* Wien Ak. Sb. 100 (1891) (Ab. 2a) 352-.
- — — *Schlamp, A.* Giessen Oberh. Gs. B. 31 (1896) 100-.
- experimental fact. *Vargiu, G. I.* Les Mondes 10 (1866) 267-.
- at high temperatures. *Ehrhardt, O.* A. Ps. C. 24 (1885) 215-.
- — — *Sutherland, W.* Ph. Mg. 26 (1886) 298-.
- Kopp's method. *Wüllner, A.* Bonn SB. Niedr. Gs. (1867) 28-.
- by method of known chemical action. *Brusotti, F.* Rm. At. R. Ac. 25 (1872) 350-.
- mixture. *Bohn, C.* A. Ps. C. 122 (1864) 289-.
- — — *Poynting, J. H.* [1883] Birm. Ph. S. P. 4 (1885) 47-.
- — — *Gezechus [Hesehus], N.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 432-; J. de Ps. 7 (1888) 489-.
- Specific heat and characteristic function for any body. *Phillips, É.* C. R. 86 (1878) 1290-, 1351-.
- — — — — (Phillips). *Lévy, M.* C. R. 86 (1878) 1391-.
- near critical point, influence of pressure. *Heen, P. de.* Brux. Ac. Bll. 27 (1894) 232-.
- — — — — and density in same series. *Moutier, J.* Par. S. Phlm. Bll. 7 (1883) 80-.

Specific heat and elasticity. *Cantoni, G.* Mil. I. Lomb. Rd. 2 (1869) 201-, 231-, 334-.

— — — and other physical constants. *Tomlinson, H.* R. S. P. 38 (1885) 488-.

— — — energy of body. *Clausius, R. C. R.* 87 (1878) 718-.

— — — expansion. *Tredgold, T.* Tilloch Ph. Mg. 52 (1818) 251-.

— — —. *Phillips, É.* C. R. 71 (1870) 333-.

— — — latent heat, and heat of spontaneous expansion. *Fusini, A.* Brugnatelli G. 6 (1823) 131-.

— — — molecular pressure. *Barus, C.* Am. Ac. P. 26 (1891) 813-.

— — — state of aggregation, kinetic theory. *Walter, A.* [1881] A. Ps. C. 16 (1882) 500-.

— — — volume, laws. *Phillips, S. E.* Nt. 30 (1884) 288-.

## SPECIFIC HEATS OF LIQUIDS.

*Groshans, J. A.* Arch. Néerl. 5 (1870) 1-, 193-.

*Baumgartner, G.* Carl Rpm. 17 (1881) 586-.

*Nadeždin, A. I.* Kiev S. Nt. Mm. 7 (1884) xcix-; Rs. Ps.-C. S. J. 16 (Ps.) (1884) 222-; Exner Rpm. 20 (1884) 446-.

belonging to homologous series. *Schiff, R.* Gz. C. It. 16 (1886) 454-.

calculation. *Pagliani, S.* Tor. Ac. Sc. At. 20 (1885) 54-.

— *Langlois, M.* C. R. 104 (1887) 420-.

and cohesion and density. *Bartoli, A.* N. Cim. 6 (1879) 141-.

— internal forces. *Puschl, C.* Wien Ak. Sb. 98 (1890) (Ab. 2a) 173-.

— — — in water. *Puschl, C.* Wien Ak. Sb. 97 (1889) (Ab. 2a) 1118-.

measurement. *Wartmann, É.* Arch. Sc. Ps. Nt. 38 (1870) 62-.

— *Grimaldi, G. P.* Rm. R. Ac. Linc. Rd. 7 (1891) (Sem. 2) 58-.

— *Bartoli, A., & Stracciati, E.* Catania Ac. Gioen. Bll. 23-24 (1892) 10-.

— *Litch, R. L.* Ps. Rv. 5 (1897) 182-.

— *Rosenhain, W.* Vict. R. S. P. 10 (1898) 97-.

— *Negreano, D.* C. R. 128 (1899) 875-.

— Andrew's method, errors. *Gumlich, E., & Wiebe, H. F.* A. Ps. C. 66 (1898) 530-.

— — — improved. *Pfaundler, L.* A. Ps. C. 67 (1899) 439-.

— near critical temperature. *Heen, P. de.* Brux. Ac. Bll. 15 (1888) 522-.

solutions. *Mathias, E.* C. R. 107 (1888) 524-; J. de Ps. 8 (1889) 204-, 619-.

— *Tammann, G.* Z. Ps. C. 18 (1895) 625-.

— *Konovalov, D.* Rs. Ps.-C. S. J. 30 (C.) (1898) 353-; Par. S. C. Bll. 22 (1899) 3-.

— (Konovalov). *Biron, E.* Rs. Ps.-C. S. J. 30 (C.) (1898) 355-; Par. S. C. Bll. 22 (1899) 3-.

— not electrolytes. *Magie, W. F.* Ps. Rv. 9 (1899) 65-.

—, and thermal effect in their formation. *Aleksyev, V. T.* [1883] (x) Rs. Ps.-C. S. J. 16 (Pt. 1) (1884) 109-; Berl. B. 17 (1884) (Ref.) 193-.

—, variation with strength. *Mathias, E.* Par. S. Ps. S6. (1888) 354-.

variation with temperature. *Heen, P. de, & Deruyts, F.* Brux. Ac. Bll. 15 (1888) 168-.

## SPECIFIED LIQUIDS.

ammonia, anhydrous. *Elleau, L. A., & Ennis, W. D.* Franklin I. J. 145 (1898) 189-, 280-.

—, liquefied. *Strombeck, E. von.* Franklin I. J. 130 (1890) 467-.

—, —. *Ludeking, C., & Starr, J. E.* Am. J. Sc. 45 (1893) 200-.

aniline, variation with temperature. *Griffiths, E. H.* [1894] L. Ps. S. P. 13 (1895) 234-; Ph. Mg. 39 (1895) 47-, 143-.

—, —. *Bartoli, A.* Mil. I. Lomb. Bd. 28 (1895) 1032-.

—, "volume heat." *Griffiths, E. H.* Camb. Ph. S. P. 8 (1895) 303-.

benzene. *Demerliac, —.* As. Fr. C. R. (1894) (Pt. 2) 325-.

blood. *Hillerson, S., & Stein-Bernstein, D.* [1898] Pliste. Rs. 1 (1898-99) 43-.

— *Bordier, H.* C. R. 130 (1900) 799-; J. Pl. Pth. Gén. 2 (1900) 381-.

brines of different specific gravity. *Strombeck, H. von.* Franklin I. J. 134 (1892) 154-.

carbon compounds. *Schiff, R.* Z. Ps. C. 1 (1887) 376-.

hydrocarbons (C<sub>n</sub>H<sub>2n+2</sub>). *Bartoli, A., & Stracciati, E.* Mil. I. Lomb. Rd. 29 (1896) 157-.

— *Pagliani, S.* N. Cim. 4 (1896) 146-.

— and alcohols. *Pagliani, S.* Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 885-.

lava. *Bartoli, A.* Catania Ac. Gioen. At. 3 (1891) 61-; Mil. I. Lomb. Rd. 29 (1896) 363-.

mercury. *Hedelius, E., & Pettersson, O.* Stockh. Öfv. 35 (1878) No. 2, 35-; A. Ps. C. Beibl. 2 (1878) 398-.

— *Langlois, M.* C. R. 103 (1886) 1009-.

— (0° to 30°). *Bartoli, A., & Stracciati, E.* Mil. I. Lomb. Rd. 28 (1895) 469-.

—, variation with temperature. *Winkelmann, A. A.* A. Ps. C. 159 (1876) 152-.

—, —. *Pettersson, O.* Stockh. Öfv. 35 (1878) No. 9, 3-; A. Ps. C. Beibl. 3 (1879) 739-.

—, —. *Naccari, A.* Tor. Ac. Sc. At. 23 (1887-88) 594-.

—, —. *Milthaler, J.* A. Ps. C. 36 (1889) 897-.

—, —. *Heilborn, E.* Z. Ps. C. 7 (1891) 85-.

—, —. *Bartoli, A., & Stracciati, E.* Catania Ac. Gioen. Bll. 26-28 (1892) 11-.

milk. *Fleischmann, W.* Münch. Ak. Sb. 4 (1874) 97-.

oil of turpentine, isomers. *Regnault, V.* A. C. 9 (1843) 322-.

organic liquids. *Schiff, R.* Gz. C. It. 17 (1887) 286-.

potassium and calcium chlorides, solutions. *Drecker, J.* A. Ps. C. 34 (1888) 952-.

saline solutions. *Person, C. C.* C. R. 31 (1850) 566-; A. C. 33 (1851) 437-, 448-.

1620 *Liquids*

## Specific Heats

*Solids* 1620

- saline solutions. *Gray, T.* Edinb. R. S. P. 10 (1880) 689-.
- soda solutions, strong. *Blümcke, A.* A. Ps. C. 25 (1885) 417-.
- sulphur dioxide, liquid. *Mathias, E.* C. R. 119 (1894) 404-.
- sulphuric acid solutions. *Cattaneo, C. N.* Cim. 26 (1889) 50-.
- water (near 4°C.). *Hirn, G. A.* C. R. 70 (1870) 592-.
- (0° to 100°C.). *Jamin, J., & Amaury, —.* C. R. 70 (1870) 661-.
- (near 4°C.). *Hirn, G. A.* C. R. 70 (1870) 831-.
- *Wüllner, F. H. A. A.* A. Ps. C. 1 (1877) 592-; 10 (1880) 284-.
- *Henrichsen, S.* A. Ps. C. 8 (1879) 83-.
- *Neesen, F.* A. Ps. C. 18 (1883) 369-.
- *Velten, A. W.* A. Ps. C. 21 (1884) 31-.
- *Sutherland, W.* Ph. Mg. 26 (1888) 298-.
- *Bartoli, A., & Stracciati, E.* Catania Ac. Gioen. Bll. 7 (1889) 3-.
- *Ekholm, N.* Stockh. Ak. Hndl. Bh. 15 (*Afd.* 1) (1890) No. 6, 35 pp.
- (below 0°C.). *Martinetti, M.* Tor. Ac. Sc. At. 25 (1890) 827-.
- *Bartoli, A., & Stracciati, E.* Catania Ac. Gioen. Bll. 18-19 (1891) 25-.
- (0° to 40°C.). *Johanson, A. M.* Stockh. Öfv. (1891) 325-; Feschr. Ps. (1891) (*Ab.* 2) 365-.
- (0° to 32°). *Bartoli, A., & Stracciati, E.* Catania Ac. Gioen. At. 4 (1892) *Mem.* 7, 96 pp.
- (— — —) (Bartoli and Stracciati). *Lungo, C. del.* Catania Ac. Gioen. At. 6 (1893) *Mem.* 1, 3 pp.
- (0° to 31°). *Bartoli, A., & Stracciati, E.* Mil. I. Lomb. Rd. 26 (1893) 517-.
- *Pettinelli, P.* [1898] J. de Ps. 8 (1899) 490.
- (0° to 100°C.). *Callendar, H. L., & Barnes, H. T.* Ps. Rv. 10 (1900) 202-.
- and alcohol mixtures. *Jamin, J., & Amaury, —.* C. R. 70 (1870) 1237-.
- — — —, variation with temperature. *Blümcke, A.* A. Ps. C. 25 (1885) 154-.
- at constant volume. *Bartoli, A., & Stracciati, E.* Mil. I. Lomb. Rd. 27 (1894) 524-.
- near maximum density. *Pfaundler, L., & Platter, H. D.* Nf. Festschr. (\*1869) 67-; Wien Sb. 62 (1870) (*Ab.* 2) 379-.
- — — — *Gerosa, G. G.* Rm. R. Ac. Linc. Mm. 10 (1881) 75-.
- and methyl alcohol mixtures. *Lecher, E.* [1877] Wien Sb. 76 (1878) (*Ab.* 2) 937-.
- , salt and fresh. *La Chabeaussière, —.* Mnnp. Rec. Bll. 2 (1805) 286-.
- , sea. *Thoulet, —, & Chevallier, —.* C. R. 108 (1889) 794-.
- , — and lake. *Somigliana, C.* Mil. I. Lomb. Rd. 30 (1897) 154-.
- , supercooled. *Cardani, P., & Tomasini, F.* N. Cim. 21 (1887) 185-.
- , — *Bartoli, A., & Stracciati, E.* N. Cim. 31 (1892) 133-.

- water, in terms of international electric units. *Schuster, A., & Gannon, W.* [1894] Phil. Trans. (A) 186 (1896) 415-.
- , uncertainty. *Weber, W. E.* Pogg. A. 18 (1830) 608-.
- , variation. *Callendar, H. L., & Barnes, H. T.* B. A. Rp. (1899) 624-.
- , — with temperature. *Rankine, W. J. M.* [1851] Edinb. R. S. T. 20 (1853) 441-.
- , — — — *Bosscha, J.* (vii) Pogg. A. (*Jubelbd.*) (1874) 549-.
- , — — — *Rowland, H. A.* [1879] Am. Ac. P. 15 (1880) 75-.
- , — — — *Dieterici, C.* A. Ps. C. 57 (1896) 338-.
- , — — — *Pernet, J.* Zür. Vjschr. 41 (1896) (*Festschr., Th.* 2) 121-.

## SPECIFIC HEATS OF SOLIDS.

- Kurz, A.* [1875] A. Ps. C. *Ergänz.* 7 (1876) 334-.
- kinetic theory. *Eddy, H. T.* Science 2 (\*1883) 424-, 850.
- measurement. *Johnson, W. R.* Franklin I. J. 14 (1834) 306-.
- *Amsler, J.* [1850] Zür. Mt. 2 (1850-52) 241-.
- at high temperatures. *Pionchon, —.* A. C. 11 (1887) 33-.
- , Regnault's method, criticism. *Pape, C.* A. Ps. C. 123 (1864) 277-.
- in small quantities. *Thoulet, J., & Lagarde, H.* C. R. 94 (1882) 1512-.
- variation with temperature. *Zakrzewski, I.* Krk. Ak. (*Mt.-Prz.*) Rz. 3 (1891) 327-; Cro. Ac. Sc. Bll. (1891) 146-.

## SPECIFIED SOLIDS.

- alloys. *Aubel, E. van.* J. de Ps. 9 (1900) 493-.
- , anomalous. *Person, C. C.* C. R. 25 (1847) 444-.
- , fusible. *Schüz, L.* A. Ps. C. 46 (1892) 177-.
- , iron-antimony. *Laborde, J.* C. R. 123 (1896) 227-.
- aluminium. *Pionchon, J.* C. R. 115 (1892) 162-, 270.
- antimony and compounds. *Pebal, L., & Jahn, H.* A. Ps. C. 27 (1886) 584-; 28 (1886) 696.
- basalt. *Roberts-Austen, W. C., & Rücker, A.* W. B. A. Rp. (1891) 610-.
- binary mixtures. *Battelli, A., & Martinetti, M.* Rm. R. Ac. Linc. Rd. 1 (1885) 621-.
- boracite, variation with temperature. *Kroeker, K.* Gött. Nr. (1892) 122-.
- building materials. *Hutchinson, J.* [1842] (*vt Adds.*) C. S. P. (1843) 24-.
- caoutchouc. *Gee, W. W. H., & Terry, H. L.* B. A. Rp. (1889) 516-; Manch. Lt. Ph. S. Mm. & P. 4 (1891) 38-.
- carbon. *Le Chatelier, H.* C. R. 116 (1893) 1051-.
- *Violle, J.* C. R. 120 (1895) 868-.

carbon, boron and silicon. *Weber, H. F.* A. Ps. C. 154 (1875) 367-, 553-.

— in different forms. *Delarive, A., & Marcet, F.* A. C. 2 (1841) 121-.

diamonds. *Carbonelli, C. E.* Genova S. Lig. At. 2 (1891) 354-.

ebonite, cork and palm wood. *Zinger, A., & Šteglajev, I.* Rs. Ps.-C. S. J. 27 (Ps.) (1895) 30-; J. de Ps. 5 (1896) 467-.

glasses. *Winkelmann, A.* A. Ps. C. 49 (1893) 401-.

— *Zubov, P.* Rs. Ps.-C. S. J. 28 (Ps.) (1896) 22-; J. de Ps. 6 (1897) 603.

ice. *Desains, É.* C. R. 20 (1845) 1345-; A. C. 14 (1845) 306-.

— *Person, C. C.* C. R. 20 (1845) 1457-.

— *Hess, H.* [1848] St. Pét. Ac. Sc. Bll. 9 (1851) 81-.

— *Langlois, M.* C. R. 102 (1886) 1451-.

iron (magnetised). *Wassmuth, A.* Wien Ak. Sb. 85 (1882) (Ab. 2) 997-.

— at high temperatures. *Hartley, W. N. I. & S. I. J.* (1897) (No. 1) 304-.

manganese steel. *Mitchell, A. C.* Edinb. R. S. T. 35 (1890) 947-.

marble. *Peirce, B. O., & Willson, R. W.* Nt. 61 (1899-1900) 387.

mellite. *Bartoli, A., & Stracciati, E.* N. Cim. 15 (1894) 5-.

metals. *Potter, R.* Edinb. J. Sc. 5 (1831) 75-.

— (Potter). *Johnston, J. F. W.* Edinb. J. Sc. 5 (1831) 265-.

— (Johnston). *Potter, R.* [1831] Edinb. J. Sc. 6 (1832) 163-.

— *Potter, R.* Edinb. J. Sc. 6 (1832) 166-.

— *Violle, J.* C. R. 85 (1877) 543-; 87 (1878) 981-; 89 (1879) 702-; J. de Ps. 7 (1878) 69-; 9 (1880) 81-.

— (15° to 320°). *Naccari, A.* [1887] Tor. Ac. Sc. At. 23 (1887-88) 107-.

— *Le Verrier, —.* C. R. 114 (1892) 907-.

— *Waterman, F. A.* Ps. Rv. 4 (1897) 161-.

— *Jaeger, W., & Diesselhorst, H.* Berl. Ak. Sb. (1899) 719-; Berl. Ps. Reichsanst. Ab. 3 (1900) 269-.

—, graphite and alloys, at low temperatures. *Behn, U.* A. Ps. 1 (1900) 257-.

— of high fusing point. *Mache, H.* Wien Ak. Sb. 106 (1897) (Ab. 2a) 590-.

— at high temperatures. *Pionchon, —.* C. R. 103 (1886) 1122-.

— low temperatures. *Behn, U.* A. Ps. C. 66 (1898) 237-.

— *Trowbridge, C. C.* Science 8 (1898) 6-.

—, quasi isotropic. *Voigt, W.* Gött. Nr. (1898) 211-.

— and other solids. *Weber, W. E.* Pogg. A. 20 (1830) 178-.

—, specific heat and internal work. *Joubin, P.* J. de Ps. 9 (1890) 554-.

— — — magnetism, relations. *Hermann, R.* Mosc. S. Nt. Bll. 7 (1834) 815-.

minerals. *Joly, J.* R. S. P. 41 (1887) 250-.

— *Sella, A.* Gött. Nr. (1891) 311-.

organic solids. *Heen, P. de.* Brux. Ao. Bll. 5 (1883) 757-.

platinum. *Violle, J. L. G.* [1877] (XII) Isère S. Bll. 8 (1879) 20-, 107-.

— *Hoadley, J. C.* Franklin I. J. 84 (1882) 91-.

—, silver, tin, lead and copper. *Bartoli, A., & Stracciati, E.* Mil. I. Lomb. Rd. 28 (1895) 524-.

quartz, variation with temperature. *Pionchon, —.* C. R. 106 (1888) 1344-.

rocks of the Campagna. *Morano, F.* Rm. R. Ac. Linc. Rd. 7 (1898) (Sem. 2) 61-, 357.

—, igneous. *Barus, C.* Ph. Mg. 35 (1898) 296-.

— and minerals, Sicilian. *Bartoli, A.* N. Cim. 30 (1891) 231-.

salts soluble in water. *Rudberg, F.* Pogg. A. 35 (1835) 474-.

slags. *Howe, H. M.* Am. I. Mn. E. T. 18 (1890) 724-.

soil constituents, experimental determination. *Ulrich, R.* Forsch. Ag.-Ps. 17 (1894) 1-.

uranium. *Blümcke, A.* A. Ps. C. 24 (1895) 263-.

volcanite. *Mayer, A. M.* Am. J. Sc. 41 (1891) 54-.

Thermal capacity. *Donnini, P.* N. Cim. 15 (1876) 214-.

True thermal capacity. *Göransson, B.* Lund Acta Un. 7 (1870) (Mth.) No. 4, 22 pp.

— — — and disgregation of a body. *Clausius, R.* Arch. Sc. Ps. Nt. 24 (1865) 117-.

— — — — — (Clausius). *San Roberto, P. di.* Arch. Sc. Ps. Nt. 25 (1866) 84-.

— — — — — *Budde, E.* A. Ps. C. 141 (1870) 426-.

— — — — — heat-content. *Robin, G.* [1879] Par. S. Phlm. Bll. 4 (1880) 8-.

Variation with temperature. *Wassmuth, A.* Mh. Mth. Ps. 1 (1890) 473-.

— — — *Sohncke, L.* Münch. Ak. Sb. 27 (1898) 337-.

Volatile bodies, relation between latent heat, specific heat and specific volume. *Trouton, F. T.* Nt. 27 (1883) 292.

Water, total heat, recalculated from experiments of Regnault and Rowland. *Shaw, W. N.* B. A. Rp. (1896) 162-.

## 1640 Specific Heats of Gases and Vapours.

(See also Chemistry 7220.)

Heat of permanent gases. *Plana, G.* [1842] Tor. Mm. Ac. 5 (1843) 283-.

Hydrostat, use. *Hirn, G. A.* A. Gén. Civ. 2 (1863) (pte. 2) 113-, 153-.

Kinetic theory of polyatomic gases. *Richardz, F.* Berl. Ps. Gs. Vh. (1891) 73-; A. Ps. C. 48 (1893) 467-.

Mixture of liquid and vapour, specific heat at constant volume. *Olearski, K.* [1892] Krk. Ak. (Mt.-Prz.) Rz. 6 (1893) 112-; Cro. Ac. Sc. Bll. (1892) 297-.



## RATIO OF SPECIFIC HEATS.

- Greguss, G.* (xii) *Mag. Ak. Éts. (Mth. Term.)* 6 (1865) 63-.
- Müller, J. J.* A. Ps. C. 154 (1875) 113-.
- Moutier, J.* Par. S. Phlm. Bll. 2 (1878) 81-.
- Müller, P. A.* [1882] A. Ps. C. 18 (1888) 94-.
- Burton, C. V.* Ph. Mg. 24 (1887) 166-.
- Bogaevskij, L. G.* Rs. Ps.-C. S. J. 29 (Ps.) (1897) 97-; *Fachr. Ps.* (1897) (Ab. 2) 332.
- Boltzmann, L.* C. R. 127 (1898) 1009-.
- air. *Meikle, H.* Edinb. N. Ph. J. 2 (1827) 328-.
- *Rose-Innes, J.* Ph. Mg. 48 (1899) 286-.
- , and Poisson's law. *Kurz, A.* Carl Rpm. 16 (1880) 719-.
- argon. *Carbonelli, C. E.* Genova S. Lig. At. 7 (1896) 32-.
- calculation. *Moon, W.* Ph. Mg. 18 (1884) 372-.
- (Moon). *Lodge, O. J.* Ph. Mg. 18 (1884) 472.
- *Sluginov, N. P.* Kazan S. Nt. (Ps.-Mth.) P. 5 (1887) 170-.
- , Clément and Désormes's experiment. *Bauer, K. L.* Carl Rpm. 16 (1880) 43-.
- , —, —, history. *Maneuvier, G.* Par. S. Ps. Sé. (1895) 233-.
- , —, —, method. *Swyngedaauw, R. J. de* Ps. 6 (1897) 129-.
- carbon dioxide. *Amagat, E. H.* C. R. 121 (1895) 863-, 968.
- compound gases. *Capstick, J. W.* [1895] *Phil. Trans. (A)* 186 (1896) 567-.

## Measurement.

- Jamin, J., & Richard, —.* C. R. 71 (1870) 336-.
- Amagat, E. H.* C. R. 77 (1873) 1325-.
- Moutier, J.* Par. S. Phlm. Bll. 4 (1880) 170-.
- Paquet, E.* J. de Ps. 4 (1885) 30-.
- Amagat, —.* J. de Ps. 4 (1885) 174-.
- Lummer, O., & Pringsheim, E.* Berl. Ps. Gs. Vh. (1887) 136-; B. A. Rp. (1894) 565-.
- Pringsheim, E.* D. Nf. Vh. (1894) (Th. 2, Hälfte 1) 85-.
- Sack, P.* Offenb. Vr. Nt. B. 33-36 (1895) 71-.
- Maneuvier, G.* Par. S. Ps. Sé. (1896) 243-.
- Maneuvier, G., & Fournier, J.* C. R. 123 (1896) 228-.
- Leduc, A.* C. R. 125 (1897) 1089-, 1138.
- acetylene. *Maneuvier, G., & Fournier, J.* C. R. 124 (1897) 183-.
- air. *Weisbach, J.* Civing. 5 (1859) 46-.
- *Maneuvier, G.* C. R. 120 (1895) 1898-; A. C. 6 (1895) 321-; Par. S. Ps. Sé. (1895) 250-.
- , oxygen, carbon-dioxide and hydrogen. *Lummer, O., & Pringsheim, E.* [1898] A. Ps. C. 64 (1898) 555-; *Smiths. Ct.* 29 (1903) Art. vi, 29 pp.
- by expansion hygrometer. *Cozza, R.* Arch. Sc. Ps. Nt. 10 (1900) 132-.
- Kohlrausch's experiment. *Boltzmann, L.* A. Ps. C. 141 (1870) 473-.

- monatomic gases. *Yvon-Villarceau, A. J. F.* C. R. 82 (1876) 1127-, 1175-.
- superheated steam. *Cohen, R.* A. Ps. C. 37 (1889) 628-.
- and phosphorus. *Lucchi, G. de.* Ven. I. At. 7 (1880-81) 1305-.
- by velocity of sound. *Kayser, H.* A. Ps. C. 2 (1877) 218-.

- relation to physical properties. *Violi, A.* Rm. R. Ac. Linc. T. 7 (1883) 112-.
- variation with temperature. *Leduc, A.* C. R. 127 (1898) 659-.
- — — and pressure. *Amagat, E. H.* C. R. 122 (1896) 66-; Par. S. Ps. Sé. (1896) 24-.

- Small oscillations of gases, influence of temperature. *Gromeka, J.* *Fachr. Mth.* (1888) 1098.

## SPECIFIC HEATS OF GASES.

- Haycraft, W. T.* [1823] Edinb. R. S. T. 10 (1826) 195-.
- Delarive, A., & Marcet, F.* A. C. 35 (1827) 5-.
- Dulong, P. L.* [1828] Par. Mm. Ac. Sc. 10 (1831) 147-.
- Delarive, A., & Marcet, F.* A. C. 41 (1829) 78-.
- Apjohn, Jas.* B. A. Rp. (1835) (pt. 2) 30-.
- Delarive, A., & Marcet, F.* [1835] A. C. 75 (1840) 113-.
- Apjohn, Jas.* [1837-38] Ir. Ac. T. 18 (1838) 1-; Ir. Ac. P. 1 (1841) 206-.
- Regnault, G.* Moigno Cosmos 2 (1853) 539-.
- Schmidt, G.* Dingler 200 (1871) 19-.
- Berthelot, M.* Rv. Sc. 17 (1879) 6-.
- Margules, M.* Wien Az. 25 (1889) 135-.
- Lussana, S.* N. Cim. 36 (1894) 5-, 70-, 130-; 1 (1895) 327-; 3 (1896) 92-; Ven. I. At. (1896-97) 1018-; N. Cim. 6 (1897) 81-; 7 (1898) 365-.
- Petrini, H.* Z. Ps. C. 16 (1895) 97-.
- Leduc, A.* C. R. 127 (1898) 860-; A. C. 17 (1899) 484-.
- at constant volume. *Cazin, A.* Les Mondes 20 (1889) 672-.
- — — *Moutier, J.* C. R. 71 (1870) 807-.
- — — *Joly, J.* R. S. P. 45 (1889) 33-.
- — — *Bickerton, —.* Aust. As. Rp. (1891) 117.
- — —, measurement. *Graf, J. H.* Bern Mt. (1880) 71-.
- — —, new method. *Akin, (Dr.) C. K.* Ph. Mg. 27 (1864) 341-.
- — —, variation. *Wullner, F. H. A. A. A.* Ps. C. 4 (1878) 321-.
- error in Apjohn's formula. *Hudson, H.* Ph. Mg. 8 (1836) 21-.
- at high temperatures. *Berthelot, M., & Vieille, —.* C. R. 98 (1884) 770-.
- — — *Mallard, E., & Le Chatelier, H.* Par. S. Ps. Sé. (1888) 308-.
- — — *Stimpf, G.* Dingler 290 (1893) 213-, 235-.
- — — *Fliegner, A.* Zür. Vjschr. 44 (1899) 192-.

## 1640 Specific Heat of Gases and Vapours.

## Atomic Heat 1660

laws. *Amagat, E. H.* C. R. 180 (1900) 1443-. measurement, new method. *Wiedemann, E. E. G.* Arch. Sc. Ps. Nt. 51 (1874) 78-; 56 (1876) 273; A. Ps. C. 157 (1876) 1-. and properties of isothermals. *Amagat, E. H.* C. R. 122 (1896) 120-.  
 — refractive power of gases, relation. *Avogadro, A.* [1817-26] Mod. Mm. S. It. 18 (1818) 154-; Tor. Mm. Ac. 33 (1829) 49-.  
 variation. *Prevost, P.* Gen. Mm. S. Ps. 4 (1828) 255-, 479-.  
 —. *Winkelmann, A. A.* A. Ps. C. 159 (1876) 177-.  
 —. *Wittwer, W. C.* Z. Mth. Ps. 24 (1879) 193-.  
 —. *Linde, C.* Münch. Ak. Sb. 27 (1898) 485-.  
 —. *Sohncke, L.* A. Ps. C. 66 (1898) 111-.

### SPECIFIED GASES.

air. *Thomson, (Sir) W.* Camb. and Dubl. Mth. J. 8 (1853) 250-.  
 —. *Kurz, A.* A. Ps. C. 151 (1874) 173-.  
 —. *Casalunga, D. A.* Par. Ing. Civ. Mm. (1878) 109-.  
 —. *Kurz, A.* Exner Rpm. 20 (1884) 161-.  
 —, carbon dioxide and hydrogen at constant volume. *Joly, J.* [1890] Phil. Trans. (A) 182 (1892) 73-.  
 — at constant pressure. *Joule, J. P.* Ph. Mg. 6 (1853) 143-.  
 — — —. *Leduc, A.* C. R. 126 (1898) 1860-.  
 — — — volume. *Kohlrausch, F.* A. Ps. C. 186 (1869) 618-.  
 — — —. *Witte, L.* A. Ps. C. 138 (1869) 155-; 140 (1870) 657-; 141 (1870) 817-.  
 — — — (Kohlrausch). *Kurz, A.* A. Ps. C. 138 (1869) 335-.  
 — and steam. *Rankine, W. J. M.* [1850-57] Edinb. R. S. T. 20 (1853) 191-; Edinb. R. S. P. 3 (1857) 5-, 287-.  
 carbon dioxide, compressed. *Margules, M.* Wien Ak. Sb. 97 (1889) (Ab. 2a) 1385-.  
 — at constant volume. *Joly, J.* [1894] Phil. Trans. (A) 185 (1895) 943-.  
 — — —, as function of temperature. *Joly, J.* [1894] Phil. Trans. (A) 185 (1895) 961-.  
 — —, variation at high temperatures. *Valérius, H.* Brux. Ac. Bil. 48 (1879) 601-.  
 chlorine. *Kundt, —.* D. Nf. Tbl. (\*1879) 184.

### SPECIFIC HEATS OF VAPOURS.

*Lubbock, J. W.* Ph. Mg. 31 (1847) 90-; 9 (1855) 25-.  
 (saturated.) *Moutier, J. J.* de Ps. 2 (1873) 178-.  
 (—) *Müller, J. J.* A. Ps. C. (Jubilbd.) (1874) 227-.  
 (—) *Poinier, P. P.* Franklin I. J. 69 (1875) 227-.  
 (variation.) *Wiedemann, E. E. G.* A. Ps. C. 2 (1877) 195-.  
*Pellat, H.* J. de Ps. 7 (1878) 117-.  
 (saturated.) *Waals, J. D. van der.* Amst. Ak. Vs. M. 12 (1878) 169-; A. Ps. C. Beibl. 2 (1878) 828-.

(saturated.) *Bouty, E.* J. de Ps. 4 (1885) 28-.  
*Morera, G.* Rm. R. Ac. Linc. Rd. 7 (1891) (Sem. 2) 119-.  
 (saturated.) *Mathias, E.* C. R. 119 (1894) 849-; Toul. Fac. Sc. A. 12 (1896) E, 17 pp.

### SPECIFIED VAPOURS.

acetic acid and nitrogen tetroxide. *Threlfall, R.* Ph. Mg. 23 (1887) 223-.  
 ether. *Tsuruta, K.* Ph. Mg. 48 (1899) 288-.  
 mercury. *Kundt, A., & Warburg, E.* [1875] A. Ps. C. 157 (1876) 353-.  
 —. *Naumann, A.* Berl. B. 8 (1875) 1063-.  
 — (Naumann). *Kundt, A., & Warburg, E.* Berl. B. 8 (1875) 1514-.  
 steam. *Stefan, J.* Pogg. A. 110 (1860) 598-.  
 —. *Gray, J. M. F. L.* Ps. S. P. 5 (1884) 87-; Ph. Mg. 13 (1882) 337-.  
 —. *Antoine, C.* C. R. 109 (1889) 366-.  
 —. *Tumlirz, O.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 1395-.  
 —, applied to steam engine theory. *Frank, A.* Hann. Arch.-Vr. Z. 37 (1891) 337-.  
 — at constant pressure. *Tumlirz, O.* Wien Ak. Sb. 106 (1897) (Ab. 2a) 654-.  
 —, superheated. *Ewing, J. A., & Dunkerley, S. B. A.* Rp. (1897) 554-.  
 water vapour and carbon dioxide at high temperatures. *Berthelot, M., & Vieille, —.* C. R. 98 (1884) 852-.

Steam in gas generators. *Schoefel, R.* Berg-Hm. Ztg. 43 (1884) 205.  
 — — —, use, thermochemistry. *Schmidt, A.* Berg-Hm. Ztg. 43 (1884) 25-.  
 Temperature, law. *Meikle, H.* Thomson A. Ph. 12 (1826) 366-.  
 Vapours, total heat. *Antoine, C.* A. C. C. 26 (1892) 426-.

## 1660 Chemical Constitution and Specific Heat (Dulong and Petit Law, etc.). (See also Chemistry 7220.)

### ATOMIC HEAT.

*Hermann, R.* Mosc. S. Nt. N. Mm. 3 (1884) 135-.  
*Schmidt, G.* [1865] Wien Sb. 52 (1866) (Ab. 2) 417-.  
*Alusimov, I. P.* [1872] (xii) Rs. C. Ps. S. J. 5 (Pt. 1) (1873) 63-.  
*Rabuteau, —.* Par. S. Bl. Mm. 34 (\*1882) (C. R.) 376-.  
 Additivity. *Meyer, S.* Wien Ak. Sb. 109 (1900) (Ab. 2a) 405-.  
 Atomic heat of gases, expansion and mechanical equivalent. *Violi, A.* Rm. R. Ac. Linc. T. 7 (1883) 243-.  
 — — and kinetic theory of gases. *Donnini, P.* N. Cim. 5 (1879) 97-.  
 Calculation on mechanical theory of heat. *Sandrucci, A.* Rv. Sc.-Ind. 18 (1886) 129-.

## 1660 Atomic Heat

### DULONG AND PETIT LAW.

- Potter, R.* Edinb. J. Sc. 5 (1831) 75-.
- Stefan, J.* Wien SB. 36 (1859) 85-.
- Moutier, J.* [1876] Par. S. Phlm. Bil. 1 (1877) 8-.
- Willotte, H.* C. R. 89 (1879) 540-, 568-.
- Moutier, J.* Rv. Sc. 18 (1880) 1174-; Par. Éc. Pol. J. Cah. 53 (1883) 31-.
- Rydberg, V. R.* Sk. Nf. F. (1892) 364-.
- Richarz, F. A.* Ps. C. 48 (1893) 708-; 67 (1899) 702-.
- exceptions. *Carbonelli, C. E.* Genova S. Lig. At. 3 (1892) 3-.
- and mechanical theory. *Mann, F.* Würzb. Ps. Md. Sb. (1890) 91-, 97-.
- probable extension. *Cantoni, G.* Rm. R. Ac. Linc. Rd. 2 (1886) (Sem. 2) 3-.
- theoretical deduction. *Staigmüller, H. A.* Ps. C. 65 (1898) 670-.
- variation. *Hirn, G. A.* C. R. 76 (1873) 191-.
- and Wœstyn's law, mechanical interpretation. *Ledieu, A. C. H.* C. R. 78 (1874) 30-.
- Naumann's theory. *Budde, E.* Bonn SB. Niedr. Gs. 27 (1870) 101-; D. C. Gs. B. 3 (1870) 726-.

Atomic volume, constant, consequences of hypothesis. *Buys-Ballot, C. H. D.* Utr. Prv. Gn. Aant. (1881) 6-.

Composition of vapours, calculation from their coefficients of expansion and latent heats of liquefaction. *Langlois, M.* C. R. 102 (1886) 1231-.

Molecular heat of bodies. *Cantoni, G.* Rm. R. Ac. Linc. Rd. 2 (1886) (Sem. 2) 43-.

— — — dissociable gaseous compounds. *Ponsot, —.* C. R. 131 (1900) 990-.

— — — gases. *Le Chatelier, H.* C. R. 104 (1887) 1780-.

— — — polyatomic gases. *Fliegner, A.* Zür. Vjschr. 45 (1900) 137-.

Specific heat of compound gases. *Avogadro, A.* Bb. It. 4 (1816) 478-; 5 (1817) 73-; Bb. Un. 29 (1840) 142-.

— — — and density. *Sluginov, N. P.* Rs. Ps. C. S. J. 19 (Ps.) (1887) 17-.

— — — laws. *Dupré, A.* C. R. 58 (1864) 163-.

— — — of metals. *Waterman, F. A.* Ps. Bv. 4 (1897) 161-.

Thermal capacity of gases, and their composition. *Mollet, J.* J. de Ps. 90 (1820) 113-.

— — — — — law. *Sluginov, N. P.* J. de Ps. 9 (1880) 48-.

— — — — — molecular velocity and melting point of an element. *Sandrucci, A.* N. Čim. 19 (1886) 64-.

## 1670 Heats of Fusion.

- Despretz, C.* C. R. 11 (1840) 806-; Pogg. A. 52 (1841) 177-.
- Person, C. C.* C. R. 23 (1846) 162-, 336-; A. C. 21 (1847) 295-; 24 (1848) 129-; 27 (1849) 250-.

## Heats of Fusion 1670

(Person.) *Delarive, A.* Bb. Un. Arch. 9 (1848) 5-.

*Person, C. C.* C. R. 29 (1849) 300-; Pogg. A. 74 (1849) 409-, 509-; 76 (1849) 426-, 536-.

*Morris, C.* J. Sc. 3 (1881) 584-, 640-.

Change of state, theory of disappearance of heat. *Irvine, W.* Nicholson J. 6 (1808) 25-.

— — — — — variation in heat. *Moutier, J.* [1877] Par. S. Phlm. Bil. 2 (1878) 68-.

Heat of fusion and pressure. *Tammann, G.* A. Ps. C. 67 (1899) 871-.

— — — — — thermal capacity. *Pickering, S. U.* R. S. P. 49 (1891) 11-.

Latent heat, anomalous result of liberation. *Erman, P.* Berl. Ab. (1825) 107-.

— — — — — and coefficient of elasticity. *Person, C.* C. R. 27 (1848) 258-; A. C. 24 (1848) 265-.

— — — — — of freezing, and means of utilising. *Lecoq, H.* Auvergne A. Sc. 24 (1851) 432-.

— — — — — liquids and vapours. *Dyer, J. C.* Manch. Lt. Ph. S. P. 7 (1868) 198-.

— — — — — and sensible heat. *Vermeir, J. L. H. C.* Leijd. A. Ac. (1830-31) 42 pp.

— — — — — of water below 0°, with remarks on formation of ice in sea. *Pettersson, O.* Stockh. Öfv. 35 (1878) No. 2, 53-; A. Pa. C. Beibl. 2 (1878) 399-.

### SPECIFIED SUBSTANCES.

Aluminium. *Pionchon, J.* C. R. 115 (1892) 162-, 270.

Benzene. *Demerliac, —.* As. Fr. C. R. (1894) (Pt. 2) 325-.

Binary alloys of lead, tin, bismuth and zinc. *Mazzotto, D.* Mil. I. Lomb. Mm. 16 (1891) 1-.

— — — — — mixtures. *Battelli, A., & Martinetti, M.* Rm. R. Ac. Linc. Rd. 1 (1885) 621-.

Formic and acetic acids, crystallisation. *Pettersson, O.* Stockh. Öfv. 35 (1878) No. 9, 17-.

Ice. *Desains, P., & La Provostaye, F. de.* C. R. 16 (1843) 837-; Pogg. A. 59 (1843) 163-; 62 (1844) 30-.

— — — — — *Wartmann, É.* [1844] Laus. Bil. S. Vd. 1 (1842-45) 287-.

— — — — — *Hess, H.* [1848] St. Pét. Ac. Sc. Bil. 9 (1851) 81-.

— — — — — *Person, C. C.* C. R. 30 (1850) 526-; A. C. 30 (1850) 73-.

— — — — — *Ångström, A. J.* Pogg. A. 90 (1853) 509-.

— — — — — *Jamin, J.* C. R. 70 (1870) 715-.

— — — — — *Langlois, M.* C. R. 102 (1886) 1451-.

— — — — — *Zakrzewski, I.* [1892] Krk. Ak. (Mt.-Prz.) Rz. 4 (1893) 247-; A. Ps. C. 47 (1892) 155-.

— — — — — experiments of Laplace and Lavoisier. *Renou, E.* C. R. 70 (1870) 929-, 1048.

— — — — — (Renou). *Jamin, J.* C. R. 70 (1870) 969-.

Lead and tin and alloys. *Rudberg, F.* Stockh. Ak. Hndl. (1829) 157-; Pogg. A. 18 (1830) 240-; 19 (1830) 125-.

Mercury. *Person, C. C.* C. R. 25 (1847) 334-; A. C. 24 (1848) 257-.  
 —. *Langlois, M.* C. R. 103 (1866) 1009-.  
 Pig-iron and other metals. *Minary, —, & Rézal, —.* A. Mines 19 (1861) 401-.  
 Platinum. *Violle, J. L. G.* [1877] (xii) Isère S. Bll. 8 (1879) 20-, 107-.  
 Wax, metals, etc. *Irvine, W.* Nicholson J. 9 (1804) 45-.

### 1680 Heats of Vaporisation.

*Desprez, C.* A. C. 24 (1823) 323-.  
*Person, C. C.* C. R. 17 (1843) 495-.  
*Andrews, T.* [1847] C. S. J. 1 (1849) 27-.  
*Legrand, J. N.* C. R. 42 (1856) 213-.  
*Groshans, J. A.* Arch. Néerl. 5 (1870) 1-, 193-.  
*Moutier, J.* Par. S. Phlm. Bll. 1 (1877) 17-; 4 (1880) 247-.  
*Puschl, K.* [1890] Wien Ak. Sb. 82 (1881) (Ab. 2) 1102-.  
*Morris, C.* J. Sc. 3 (1881) 584-, 640-.  
*Walter, A.* [1881] A. Ps. C. 16 (1882) 500-.  
*Bouty, E.* J. de Ps. 4 (1885) 26-.  
*Fuchs, K.* Exner Rpm. 26 (1890) 345-.  
*Jäger, G.* Wien Ak. Sb. 100 (1891) (Ab. 2a) 1122-.  
*Bakker, G.* Z. Ps. C. 10 (1892) 558-.  
*Tsuruta, K.* J. de Ps. 2 (1893) 272-.  
*Pagliani, S.* N. Cim. 2 (1895) 312-.  
*Louguinine, W.* A. C. 7 (1896) 251-.  
*Müner, S. R.* Ph. Mg. 43 (1897) 291-, 464.  
*Thiesen, M.* Berl. Ps. Gs. Vh. (1897) 80-.  
*Groshans, J. A.* A. Ps. C. 64 (1898) 778-.  
*Louguinine, W.* A. C. 13 (1898) 289-.  
 Caloric, quantity necessary to produce equal volumes of vapours. *Apjohn, Jas.* Ir. Ac. P. 5 (1859) 272-.  
 Change of state, theory of disappearance of heat. *Irvine, W.* Nicholson J. 6 (1803) 25-.  
 — — — variation in heat. *Moutier, J.* [1877] Par. S. Phlm. Bll. 2 (1878) 68-.  
 Heat of gases and vapours. *Poisson, S. D.* A. C. 23 (1823) 337-.  
 — — — vaporisation, and expansion. *Groshans, J. A.* A. Ps. C. 64 (1898) 789-.  
 — — — influence of electrification. *Fontaine, É.* J. de Ps. 6 (1897) 16-.  
 — — — and internal condition. *Puschl, K.* Wien Ak. Sb. 75 (1877) (Ab. 2) 745-.  
 — — — — specific heat; and alcoholic engines. *Meikle, H.* Tilloch Ph. Mg. 68 (1826) 34-.  
 — — — — theory of elastic fluids. *Pouillet, C. S. M.* C. R. 24 (1847) 915-.  
 — — — — vapour density found by vapour calorimeter. *Allen, H. N.* [1890] Nebr. Un. Stud. 1 (1888-92) 195-.  
 — — — — pressures. *Rodzevič, N. M.* Rs. Ps.-C. S. J. 30 (Ps.) (1898) 183-; J. de Ps. 9 (1900) 55-.  
 Latent and specific heat of water-vapour as means of heating. *Taddei, G.* (xii) Firenze Ac. Geogr. At. 11 (1833) 65-.  
 Law. *Person, C. C.* C. R. 23 (1846) 524-.  
 —. *Le Chatelier, H.* Par. S. C. Bll. 47 (1887) 4, 289.  
 —. *Tumilrız, O.* Wien Ak. Sb. 101 (1892) (Ab. 2a) 184-.

Law, Van der Waals's. *Darzens, G.* C. R. 124 (1897) 610-.  
 Measurement. *Trouton, F.* Nt. 30 (1884) 187.  
 —. *Pagliani, S.* Rm. R. Ac. Linc. Rd. 3 (1894) (Sem. 1) 249-.  
 —. *Louguinine, —.* Par. S. Ps. 86. (1899) 66°-.  
 — at 0° C. by Bunsen's ice calorimeter. *Svensson, A.* Stockh. Öfv. (1895) 587-; Fsch. Ps. (1895) (Ab. 2) 398.  
 — by calorimetry. *Mathias, E.* C. B. 106 (1888) 1146-.  
 — — — steam calorimeter. *Wirtz, K.* A. Ps. C. 40 (1890) 438-.  
 Relation to other magnitudes. *Kraevič, K. D.* Rs. Ps.-C. S. J. 21 (Ps.) (1889) 137-; J. de Ps. 9 (1890) 535.  
 — — — physical properties. *Aubel, E. van.* J. de Ps. 5 (1896) 70-.  
 — — — pressure. *Clausius, R.* Pogg. A. 62 (1851) 274-.  
 — — — temperature. *Heen, P. de.* Brux. Ac. Bll. 8 (1884) 210-.  
 — — — and pressure. *Ure, Andr.* Phil. Trans. (1818) 338-.  
 — — — — (Ure). *Tredgold, T.* Tilloch Ph. Mg. 66 (1825) 277.  
 — — — —. *Linebarger, C. E.* Am. J. Sc. 49 (1895) 380-.  
 — — — thermal capacity of liquids. *Nadeidin, A. I.* [1885] Kiev S. Nt. Mm. 8 (1) (1886) ii-.

### SPECIFIED SUBSTANCES.

Air and carbon dioxide. *Behn, U.* A. Ps. 1 (1900) 270-.  
 Ammonia, liquefied. *Strombeck, H. von.* Franklin I. J. 130 (1890) 467-; 131 (1891) 470-.  
 Benzene. *Griffiths, E. H., & Marshall, (Miss) D.* [1895] L. Ps. S. P. 14 (1896) 16-; Ph. Mg. 41 (1896) 1-.  
 Carbon dioxide near critical temperature. *Mathias, E.* C. B. 109 (1889) 470-.  
 Hydrochloric acid. *Tsuruta, K.* Ph. Mg. 85 (1893) 435-.  
 Liquefied gases. *Mathias, E.* A. C. 21 (1890) 69-; Par. S. Ps. 86. (1890) 122-.  
 —. *Bakker, G.* J. de Ps. 6 (1897) 131-.  
 Liquids at boiling points. *Marshall (Miss) D., & Ramsay, W.* [1895] L. Ps. S. P. 14 (1896) 57-; Ph. Mg. 41 (1896) 38-.  
 Mercury. *Langlois, M.* C. R. 103 (1886) 1009-.  
 Organic compounds. *Jahn, H.* Z. Ps. C. 11 (1893) 787-.  
 Volatile bodies, relation between latent heat, specific heat and specific volume. *Trouton, F. T.* Nt. 27 (1883) 292.  
 — liquids. *Chappuis, J.* C. R. 104 (1887) 897-; 106 (1888) 1007-; A. C. 15 (1888) 498-.  
 Water. *Pambour, F. M. G. de.* Pogg. A. 59 (1843) 587-.  
 —. *Murphy, J. J.* (xii) Belfast NH. S. P. (1875-76) 42-.

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- Water (at 0°). *Dieterici, C.* A. Ps. C. 37 (1889) 494-.
- *Ekkholm, N.* Stockh. Ak. Hndl. Bh. 15 (Afd. 1) (1890) No. 6, 35 pp.
- *Hartog, P. J., & Harker, J. A.* [1898] Nt. 49 (1893-94) 5.
- *Griffiths, E. H.* [1895] Phil. Trans. (A) 186 (1896) 261-.
- *Nipher, F. E.* St. Louis Ac. T. 6 (1895) xvi.
- *Harker, J. A.* Manch. Lt. Ph. S. Mm. & P. 10 (1896) 38-.
- from saturated salt solutions. *Trouton, F. T.* [1899] Ir. Ac. T. 31 (1896-1901) 345-.
- Zinc and cadmium. *Sutherland, W.* Ph. Mg. 46 (1898) 345-.

## 1690 Heats of Dissolution.

(See also Chemistry 7230.)

- Ammonia, heat of absorption by water. *Strombeck, H. von.* Franklin I. J. 131 (1891) 71-.
- Heat of dissolution of gases in liquids. *Pickering, S. U.* Ph. Mg. 34 (1892) 35-.
- solution, especially of  $\text{CdSO}_4 \cdot 8/3 \text{H}_2\text{O}$ . *Holsboer, H. B.* [1900] Amst. Ak. Vs. 9 (1901) 399-; Amst. Ak. P. 3 (1901) 467-.

## 1695 Heats of Transformation.

- Moutier, J.* C. R. 76 (1873) 365-.
- Alloys, heat of combination of metals in formation. *Galt, A. B.* A. Rp. (1898) 787-.
- — — — — *Brit. Ass. Comm.* B. A. Rp. (1899) 246-.
- , thermal changes in formation. *Mazzotto, D.* Mil. I. Lomb. Rd. 18 (1885) 165-.
- Ammonium nitrate. *Bellati, M., & Romanese, R.* Ven. I. At. (1885-86) 1395-.
- Coagulation of milk. *Berninzone, M. R.* Genova S. Lig. At. 11 (1900) 277-.
- Iron and steel at a bright red heat, peculiarities. *Newall, H. F.* Ph. Mg. 24 (1887) 435-.
- — —, critical points. (Latent heat of hardening.) *Osmond, F. I. & S. I. J.* (1890) (No. 1) 38-.
- wire, molecular changes at low red heat. *Barrett, W. F.* Ph. Mg. 46 (1873) 472-.
- Metals, change of condition at high temperatures. *Pionchon, —.* A. C. 11 (1887) 33-.
- Potassium nitrate. *Bellati, M., & Romanese, R.* Ven. I. At. (1884-85) 653-.
- — —, temperature of transformation in presence of other nitrates. *Bellati, M., & Lussana, S.* Ven. I. At. (1890-91) 995-.

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- Shand, R.* Tel. J. 26 (1890) 247.
- investigation methods. *Smith, F. J.* Ph. Mg. 31 (1891) 433-.
- iron. *Forbes, G.* [1874] Edinb. R. S. P. 8 (1875) 363-.
- *Tomlinson, H.* L. Ps. S. P. 9 (1888) 107-; Ph. Mg. 25 (1888) 103-.
- *Hopkinson, J.* B. S. P. 45 (1889) 455-.

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- iron. *Thomson, E.* Tel. J. 24 (1889) 471.
- *Terebin, S. J., & Razing, B. L.* Rs. Ps. C. S. J. 26 (Ps.) (1894) 200-.
- and steel, anomalous changes during recalescence. *Svedelius, G. E.* Jern-Kont. A. 51 (1897) 202-; Ph. Mg. 46 (1898) 178-.
- and magnetism. *Hopkinson, J. R. S. P.* 48 (1891) 442-.
- steel. *Newall, H. F.* Ph. Mg. 25 (1888) 510-.
- *Thomson, E.* Tel. J. 24 (1889) 616-.

- Silver and copper sulphides and selenides. *Bellati, M., & Lussana, S.* Ven. I. At. (1888-89) 1051-.
- iodide, dimorphism. *Mallard, E., & Le Chatelier, —.* Par. S. Ps. 86. (1885) 18-.

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### 1800 General.

- Wills, T.* Phm. J. 5 (1875) 990-.
- Berthelot, M.* Rv. Sc. 17 (1879) 6-.
- Absorption of gases, resulting change in density and volume of liquid. *Ångström, K.* Stockh. Öfv. (1887) 415-.
- Artificial rain. *Errera, L.* [1896] Ciel et Terre 17 (1896-97) 353-.
- Bodies in gaseous and cloudy states. *Ladame, H.* [1859] Neuch. Bl. 5 (1859-61) 155-.
- Calorimetric study of a salt. *Monnet, E.* Bordeaux S. Sc. PV. (1896-97) 15-; Bordeaux S. Sc. Mm. 3 (1899) 41-.
- Carbon dioxide, solid, experiment. *Prytz, K.* Ph. Mg. 39 (1895) 308.
- Change of state as affecting communication of heat. *Gill, J.* Ph. Mg. 32 (1866) 420-.
- — —, effect of pressure. *Ponsot, A. C. R.* 123 (1896) 595-.
- — — and free energy. *Moutier, J.* Par. Éc. Pol. J. 57 (1887) 99-.
- Condensers, theory. *Dwvshauvers-Dery, V.* Rv. Un. Mines 5 (1889) 225-.
- Density of saturated vapour and laws of solidification and evaporation of solvent. *Raoult, E. M.* Z. Ps. C. 13 (1894) 187-.
- Disintegration of electrically heated platinum and palladium wire. *Stewart, W. A. Ps. C.* 66 (1898) 88-.
- — — wires, and metallic vapours formed. *Toepler, M.* A. Ps. C. 65 (1898) 873-.
- — — glowing metals. *Berliner, A. A. Ps. C.* 33 (1888) 289-.
- — — platinum. *Kayser, H. A. Ps. C.* 34 (1888) 607-.
- Evaporation, melting and sublimation. *Planck, M.* A. Ps. C. 15 (1882) 446-.
- Forms taken by bodies during dissolution in fluids. *Bartoli, A., & Papasogli, E. G.* [1885] Pisa S. Tosc. At. (Mm.) 7 (1886) 184-.
- Freezing as an aid to sinking foundations. *Reichenbach, O. B. A. Rp.* (1886) 799-.
- — — — — shafts. *Lebreton, F. A.* Mines 8 (1885) 111-.

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— — — *Dove, H. W.* Pogg. A. 23 (1831) 290-.

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— *Martini, T.* Ven. I. At. (1896-97) 502-.  
— *Lagergren, S.* [1898] Stockh. Ak. Hndl. Bh. 24 (Afd. 2) (1899) No. 5, 14 pp.  
— *Martini, T.* Ven. I. At. (1897-98) 927-.  
— *Ercolini, G.* N. Cim. 9 (1899) 110-.  
— (Ercolini). *Martini, T.* N. Cim. 9 (1899) 334-.  
— (Martini). *Ercolini, G.* N. Cim. 9 (1899) 446-.  
— (Ercolini). *Martini, T.* N. Cim. 10 (1899) 42.  
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 —. *Arago, D. F. J.* Par. Bur. Long. An. (1833) 244-  
 —. *Farquharson, J.* Phil. Trans. (1835) 329-; (1841) 37-  
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- — — *Demerliac, R.* J. de Ps. 7 (1898) 591-.
- — —, benzene. *Demerliac, R.* C. R. 122 (1896) 1117-; 124 (1897) 75-.
- — —, ice. *Beck, L. C.* Silliman J. 45 (1843) 49-.
- — —, —. *Thomson, (Sir) W.* Ph. Mg. 37 (1850) 123-.
- — —, —. *Goossens, B. J.* Arch. Néerl. 20 (1886) 449-.
- — —, igneous rock. *Barus, C.* Am. J. Sc. 43 (1892) 56-; U. S. G. Sv. Bll. No. 96 (1892) 100 pp.; Ph. Mg. 35 (1893) 296-.
- — —, paraffin, etc. *Peddle, W.* Edinb. R. S. P. 13 (1836) 155-.
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- Regelation. *Faraday, M.* R. S. P. 10 (1859-60) 440-.
- *Brayley, E. W.* R. S. P. 10 (1859-60) 450-.
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- *Gill, J.* [1865] Ph. Mg. 31 (1866) 119-.
- *Helmholtz, H.* Arch. Sc. Ps. Nt. 26 (1866) 241-.
- *La Harpe, J. de.* [1866] Laus. Bll. S. Vd. 9 (1866-68) 85-.
- *Bottomley, J. T.* Nt. 5 (1872) 185.
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- Sinking of foundations, congelation process. *Reichanbach, B.* B. A. Rp. (1886) 799-.
- shafts, congelation process. *Lebreton, F.* A. Mines 8 (1885) 111-.
- Skating and J. Thomson's thermodynamic relation. *Joly, J.* Nt. 59 (1898-99) 485-.
- Snow and ice under pressure below 32° F. *Hungerford, E.* Am. J. Sc. 23 (1882) 434-.
- , plastic. *Williams, E. H. (jun.)* Science 5 (1885) 189.
- , rapid melting round plants. *Melloni, M.* C. R. 6 (1838) 801-.
- Snowflakes, artificial production. *Dogiel, J.* [1874] St. Pét. Ac. Sc. Bll. 20 (1875) 337-.
- Solid state, limits. *Tammann, G.* Dorpat Sb. 11 (1896) 275-; A. Ps. C. 62 (1897) 280-; 66 (1898) 473-.
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- — —. *Tammann, G.* A. Ps. C. 68 (1899) 558-, 629-; A. Ps. 2 (1900) 1-, 424; 3 (1900) 161-.
- water. *Guthrie, Fred.* [1877] B. I. P. 8 (1879) 302-.
- Solidification. *Dufour, L.* Bb. Un. Arch. 11 (1861) 22-; C. R. 52 (1861) 878-.
- of some liquids, temperature, and influence of cooling on rate of reaction. *Aleksëv, P. P.* [1885] Kiev S. Nt. Mm. 8 (1) (1886) li-.
- — certain organic substances. *Bruner, L.* C. R. 120 (1895) 914-.
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- Marx, C. M.* Schweigger J. 60 (=Jb. 30) (1830) 1-, 127-; Erdm. J. Pr. C. 22 (1841) 135-.
- Bischof, G.* Leonhard u. Bronn N. Jb. (1843) 1-.
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- Kopp, H.* Lieb. A. 93 (1855) 129-; A. C. 47 (1856) 291-.
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- Muirhead, H.* Glasg. Ph. S. P. 12 (1890) 121-.
- Love, J.* B. A. Rp. (1881) 564-.
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- igneous rock. *Barus, C.* Ph. Mg. 85 (1898) 173-.
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- *Howe, H. M.* [1885] Am. I. Mn. E. T. 14 (1886) 400-.
- , cast. *Musket, D.* Tilloch Ph. Mg. 18 (1804) 1-.
- , —. *Anderson, R., & Hannay, J. B.* [1879] Edinb. B. S. P. 10 (1880) 359-.
- mercury. *Erman, A.* Erman Arch. Bs. 1 (1841) 321-.
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- *Vicentini, G.* [1886] Tor. Ac. Sc. At. 22 (1886-87) 28-.
- *Vicentini, G., & Omodei, D.* Tor. Ac. Sc. At. 22 (1886-87) 712-.
- and alloys. *Wiedemann, E. E. G.* A. Ps. C. 20 (1883) 228-.
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- rocks and minerals. *Joly, J.* [1897] Dubl. S. So. T. 6 (1898) 283-.
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- thallium. *Pacher, G.* N. Cim. 2 (1895) 143-.
- water. *Dickson, S.* Tilloch Ph. Mg. 7 (1800) 69-.
- *Renner, C. F.* Crell C. A. 2 (1803) 354-.
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## 1840 Saturated Vapours. Pressure; Boiling-Points. Evaporation.

(See also Chemistry 7210;  
Meteorology 1050.)

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Aeolipile, date. *Folgheraiter, G.* Bm. R. Ac. Linc. Rd. 5 (1896) (Sem. 1) 392-.

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- Le Chatelier, H.* C. R. 121 (1895) 323-.
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- determination by platinum thermometer. *Griffiths, E. H.* [1890] Phil. Trans. (A) 182 (1892) 43-.
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- ether. *Bostock, J.* Thomson A. Ph. 9 (1825) 198-.
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- — —, Kopp's law. *Winkelmann, A. A. A.* Ps. C. 1 (1877) 430-; Lieb. A. 204 (1880) 251-.
- hydrogen under reduced pressure. *Devar, J.* R. S. P. 64 (1899) 227-.
- liquid under any pressure, calculation. *Hinrichs, G.* Z. Ps. C. 8 (1891) 340-.
- mercury, oil, etc. *Heinrich, P.* Schweigger J. 1 (1811) 214-.
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- sulphur, determination by platinum resistance thermometer. *Callendar, H. L., & Griffiths, E. H.* [1890] Phil. Trans. (A) 182 (1892) 119-.
- variation. *Bostock, J.* QJ. Sc. 19 (1825) 148.
- of water at different altitudes. *Izarn, —.* C. R. 20 (1845) 169-.
- — — —. *Wisse, S.* A. C. 28 (1850) 118-.
- — — Madrid. *Rico y Sinobas, M.* Madrid Rv. 7 (1857) 361-.
- —, and thermometric fixed points. *Broch, O. J.* Par. Poids et Mes. Tr. Mm. 1 (\*1881) A. 41-.
- zinc. *Violle, J.* C. R. 94 (1882) 720-.
- — and cadmium. *Berthelot, D.* C. R. 181 (1900) 380-.

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—, formation in charged gases. *Townsend, J. S.* Camb. Ph. S. P. 9 (1898) 244-.

—, — with ozone. *Townsend, J. S.* [1899] Camb. Ph. S. P. 10 (1900) 52-.

— in moist air, production by ultra-violet light. *Wilson, C. T. R.* Camb. Ph. S. P. 9 (1898) 392-.

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- Clouds, physical state of water in. *Besson, L.* Rv. Sc. 4 (1895) 46-.
- , re-formation, influence of dissolved substances and of electrification. *Wilson, H. A.* Ph. Mg. 45 (1898) 454-.
- Condensation, cloudy, and atmospheric dust, relation. *Aitken, J.* U. S. Weath. Bur. Bll. 11 (1894) 734-.
- , —, coloured, as depending on temperatures and dust-contents of air. *Barus, C.* [1898-95] U. S. Weath. Bur. Bll. 12 (1895) 104 pp.; Ph. Mg. 38 (1894) 19-.
- , —, phenomena. *Aitken, J.* R. S. P. 51 (1892) 408-.
- , comparative efficiency of + and - charged ions as nuclei. *Wilson, C. T. R.* [1899] Phil. Trans. (A) 193 (1900) 289-.
- , effect of nuclei. *Tait, —.* Edinb. R. S. P. 13 (1886) 78-.
- of liquid on wet substance. *Schleiermacher, A.* A. Ps. C. 8 (1879) 52-.
- — mercury at New Almaden, theory. *Christy, S. B.* [1885] Am. I. Mn. E. T. 14 (1886) 206-.
- — mixture of air and steam upon cold surfaces. *Reynolds, O.* R. S. P. 21 (1873) 275-.
- in steam pipes, prevention of heat loss. *Russner, J.* Dingler 310 (1898) 4-.
- at surface. *Anon.* (vi 315) Cuyper Rv. Un. 11 (1862) 572-.
- of vapours. *Cantor, M.* A. Ps. C. 56 (1895) 492-.
- — — and cooling of liquids. *X. Brux. J.* S. Ag. 7 (1860) 150-.
- — — during expansion or compression. *Dupré, A.* C. R. 56 (1868) 960-.
- — — — —. *Clausius, R.* C. R. 56 (1863) 1115-.
- — — — —, and their saturation, temperatures. *Duhem, P.* C. R. 102 (1886) 1548-.
- — water vapour in dust-free gases. *Wilson, C. T. R.* Phil. Trans. (A) 189 (1897) 265-.
- — — — — during expansion. *Sbrana, S.* Rv. Sc.-Ind. [24 (1892)] 214-.
- Condensers, counter-current. *Schwager, J. Z.* Vr. Rübenzuckin. 42 (1892) 396-.
- Cryophorus. *Wollaston, W. H.* [1812] Phil. Trans. (1813) 71-.
- (Wollaston's). *Silliman, B.* Silliman J. 7 (1824) 140-.
- , sulphurous acid. *Thomson, (Sir) W.* Edinb. R. S. P. 10 (1880) 442-.
- Distillation, fractional. *Thorpe, T. E.* C. S. J. 35 (1879) 544-.
- , mercury in barometer. *Hallock, W.* Science 11 (1888) 314.
- , — — *vacuo.* *Dunstan, W. R., & Dymond, T. S.* L. Ps. S. P. 10 (1890) 348-; Ph. Mg. 29 (1890) 367-.
- , metals at low pressures. *Kahlbaum, G. W.* Aroh. So. Ps. Nt. 30 (1893) 359-.
- Ether, peculiar behaviour of vapour in presence of air. *Wüllner, A.* Bonn SB. Niedr. Gs. (1868) 4-.

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### EVAPORATION.

- Wistar, C.* [1796] Am. Ph. S. T. 4 (1799) 72-.
- Dalton, J.* [1801] Manch. Ph. S. Mm. 5 (1802) 535-.
- Carradori, G.* A. C. 42 (1802) 65-.
- (Dalton.) *Gilbert, L. W.* Gilbert A. 15 (1803) 144-.
- Gay-Lussac, L. J.* Arcueil Mm. Ps. 1 (1807) 204-.
- Cotte, L.* J. de Ps. 68 (1809) 434-; 70 (1810) 206-.
- Wright, E.* Conn. Mm. Ac. 1 (1810) 69-.
- Bellani, A.* Brugnattali G. 9 (1816) 102-, 188-, 250-, 417-; 10 (1817) 348-, 422-; 3 (1820) 166-.
- Daniell, J. F.* QJ. Sc. 17 (1824) 46-.
- Bostock, J.* QJ. Sc. 18 (1825) 312-.
- Johnson, W. R.* Silliman J. 21 (1832) 304-.
- Rudberg, F.* Pogg. A. 34 (1835) 257-.
- Precht, J. J.* Pogg. A. 35 (1835) 198-.
- Espy, J. P.* Franklin I. J. 22 (1838) 74-.
- Lubbock, J. W.* Ph. Mg. 16 (1840) 434-, 510-, 562-; 17 (1840) 272-, 487-, 488-.
- (Lubbock.) *Ivory, J.* Ph. Mg. 20 (1842) 46-.
- Hunt, E. B.* Am. As. P. (1853) 8-.
- Marcet, F.* Bb. Un. Arch. 22 (1853) 305-; C. R. 36 (1853) 339-.
- Babington, B. G.* [1859] R. S. P. 10 (1859-60) 127-.
- Ruinet, —.* Par. A. Pon. Chauss. 20 (1860) 150-.
- Cantoni, G.* Mil. I. Lomb. Rd. 1 (1864) 183-.
- Stefan, J.* Wien Sb. 68 (1873) (Ab. 2) 365-.
- Moutier, J.* Par. S. Phlm. Bll. 13 (1876) 49-.
- Baumgartner, G.* Wien Ak. Sb. 75 (1877) (Ab. 2) 313-.
- Cantoni, G.* Mil. I. Lomb. Rd. 10 (1877) 842-.
- Moutier, J.* Par. S. Phlm. Bll. 1 (1877) 170-.
- Bartoli, A.* (xii) Rv. Sc.-Ind. 10 (1878) 14-.
- Cantoni, G.* Mil. I. Lomb. Rd. 12 (1879) 941-.
- Sreznevskit, B. I.* (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [(Pt. 1)] 420-, 483-; 15 (Ps., Pt. 1) (1883) 1-.
- Lang, C.* Glasg. I. Eng. T. 32 (1889) 279-.
- Russell, T.* U. S. Mly. Weath. Rv. 16 (1890) 290.
- and absorption, laws. *Tate, T.* Ph. Mg. 23 (1862) 126-, 233-; 25 (1863) 331-.
- in air in movement. *Houdaille, F.* As. Fr. C. R. (1886) (Pt. 2) 319-.
- amount as measure of mean temperature. *Müller-Erzbach, W.* Exner Rpm. 24 (1888) 575-.
- apparatus, calculation of heating surfaces. *Claassen, H.* Z. Vr. Rübenzuckin. 48 (1898) (Th. 2) 370-.
- by aspiration. *Buff, H.* Lieb. A. 18 (1836) 1-.
- atmospheric heat. *Tellier, —.* As. Fr. C. B. (1887) (Pt. 2) 889-.
- in boilers. *Swarte, — de.* C. R. 115 (1892) 334-.
- — —. *Hervier, —.* C. R. 116 (1893) 688-.

- of brine by Piccard's apparatus. *Rateau, A.* A. Mines 14 (1888) 877-.
- and capillarity, freezing of water by. *Decharme, C.* Les Mondes 87 (1875) 898-.
- from capillary tubes. *Magnus, G.* Pogg. A. 26 (1882) 463-.
- causes which modify. *Laval, E.* [1879] Bordeaux S. Sc. Mm. 3 (1890) 1-.
- by cold. *Mitchill, S. L.* Gilbert A. 11 (1802) 474-.
- in cold air. *Wistar, C.* [1787] Am. Ph. S. T. 3 (1798) 125-.
- by compressed air. *Sachse, A. O.* Aust. As. Rp. (1890) 738.
- and condensation. *Tait, —.* Edinb. R. S. P. 13 (1886) 91-.
- , forces caused by. *Reynolds, O.* R. S. P. 22 (1874) 401-.
- , ——— (Reynolds). *Crookes, W. C.* N. 30 (1874) 24-.
- cooling due to. *Configliachi, P.* Brugnattelli G. 4 (1811) 208-, 287-.
- — —. *Marcet, A.* Phil. Trans. (1818) 252-.
- — —. *Dove, H. W.* Pogg. A. 19 (1830) 356-.
- — —. *Bischof, G.* Pogg. A. 37 (1836) 259-.
- in current of air. *Montgolfier, J. M.* A. C. 76 (1810) 34-.
- decreasing in geometrical progression. *Havrez, P.* A. Gén. Civ. 3 (1874) 520-, 545-.
- dendritic patterns caused by. *Bryan, G. H.* Nt. 58 (1898) 174.
- — —. *Raisin, C. A.* Nt. 58 (1898) 224.
- dependence on form and size of containing vessel. *Kleiber, I. A.* Rs. Ps.-C. S. J. 20 (Ps.) (1898) 62-.
- — surface exposed. *Reischauer, C.* [G.] Pogg. A. 114 (1861) 177-.
- and diffusion. *Odling, W.* R. I. P. 7 (1873) 155-.
- —, influence of temperature. *Winkelmann, A.* A. Ps. C. 36 (1889) 93-.
- dissociation. *Ramsay, W., & Young, S.* [1887] Bristol Nt. S. P. 5 (1888) 298-.
- —, change of state at all temperatures. *Ramsay, W., & Young, S.* L. Ps. S. P. 8 (1887) 194-; Ph. Mg. 23 (1887) 435-; L. Ps. S. P. 9 (1888) 33-; Ph. Mg. 24 (1887) 196-.
- diurnal period. *Ragona, D.* Moncalieri Oss. Bll. 5 (1885) 201-; 6 (1886) 121-.
- and electricity, connexion. *Rowell, G. A.* (vi *Adds.*) Ph. Mg. 20 (1842) 45-.
- energy. *Ule, W.* Met. Z. 8 (1891) 91-.
- expansion during. *Sollas, W. J.* Nt. 21 (1890) 492-.
- under external force. *Kistjakovskij, V.* Rs. Ps.-C. S. J. 29 (Ps.) (1897) 273-; Fsch. Mth. (1897) 815; Rs. Ps.-C. S. J. 30 (Ps.) (1898) 139-.
- force required for. *Magnus, G.* Pogg. A. 61 (1844) 248-.
- of fresh and salt water. *Pelletreau, —.* As. Fr. C. B. (1888) (Pt. 2) 175-.
- without fusion. *Meyer, L.* Berl. B. 13 (1880) 1881-; 14 (1881) 718-.
- under high gas pressure. *Schiller, N.* Rs. Ps.-C. S. J. 29 (Ps.) (1897) 7-; J. de Ps. 6 (1897) 610-; A. Ps. C. 60 (1897) 755-.
- incipient. *Woodhouse, J. T.* Edinb. Ph. J. 36 (1844) 338-.
- influence of electricity. *Volpicelli, P.* Bm. At. R. Ac. 25 (1872) 63-.
- — —. *Reitlinger, —.* D. Nt. Tbl. (\*1875) 208.
- — —. *Mascart, É. É. N.* C. R. 86 (1878) 575-.
- — —. *Wirtz, W.* A. Ps. C. 37 (1889) 516-.
- — high temperature. *Longchamp, —.* Rv. Sc. 15 (1847) 92-.
- — pressure. *Winkelmann, A.* A. Ps. C. 33 (1888) 445-.
- — —. *Hall, E. H.* J. Ps. C. 3 (1899) 452-.
- — Röntgen rays. *Pasquini, E.* N. Cim. 11 (1900) 133-.
- — sunlight. *Heller, T. E.* Gilbert A. 4 (1800) 210-.
- — surface tension. *Miles, M.* Am. As. P. (1893) 347-.
- — weight of vapour, etc. *Blasius, E. A.* Ps. C. 40 (1890) 691-.
- internal. *Pelloggio, P.* Mil. I. Lomb. Rd. 1 (1868) 718-.
- of lake. *Hajech, C.* Mil. I. Lomb. Rd. 3 (1870) 785-.
- laws. *Houdaille, —.* C. B. 100 (1885) 170-; As. Fr. C. B. (1885) (Pt. 2) 289-.
- — —. *Schall, C., & Kossakowsky, L.* Z. Ps. C. 8 (1891) 168-, 241-.
- in limited atmosphere. *Lami, P.* N. Cim. 5 (1897) 27-.
- from limited to unlimited atmosphere. *Lesage, P.* As. Fr. C. B. (1893) (Pt. 2) 327-.
- limits. *Bellani, A.* Poligrafo 10 (1832) 161-.

## Measurement.

- Kunze, M. F.* Wien Met. Z. 15 (1880) 21-; 16 (1881) 30-.
- Formioni, C.* Mil. I. Lomb. Rd. 14 (1881) 356-.
- Carl, P.* Carl Rpm. 18 (1882) 630-.
- Galli, D. I.* Rm. N. Linc. At. 40 (1887) 84.
- Gelcich, E.* Z. Instk. 10 (1890) 47-.
- Emmerling, A.* [1893] Sohl.-Holst. Nt. Vr. Schr. 10 (1895) 114.
- Galli, I.* Rm. N. Linc. At. 52 (1899) 157-; Rm. N. Linc. Mm. 17 (1900) 165-.
- by atmometer. *Mühry, A.* Pogg. A. 113 (1861) 305-.
- —. *Le Blanc, (le lt.) C. M.* Rv. Mar. et Col. 132 (1897) 330-.
- and melting, cooling due to. *Cantoni, G.* Mil. I. Lomb. Rd. 13 (1880) 242-.
- of mercury in barometer by sun's rays. *Messier, C.* [1797] Par. Mm. de l'I. 2 (1798-99) 473-.
- Montgolfier's process. *Clément, —, & Désormes, —.* A. C. 76 (1810) 34-.
- —. *Saint-Amand, —.* Nicholson J. 29 (1811) 138-.
- —. *Schweigger, J. S. C.* Schweigger J. 2 (1811) 8-.



## PRESSURE.

- Mayer, J. T.* [1809] Götting. Cm. 1 (1808-11) 40 pp.
- Despretz, C. A. C.* 16 (1821) 105-838.
- Prechtel, J. J.* Baumgartner Z. 1 (1826) 838-.
- Tregaskis, R.* Edinb. J. Sc. 10 (1829) 282.
- Anon.* (vi 977) Phm. Cb. 5 (1834) 65-.
- Soret, J. L.* Bb. Un. Arch. 13 (1850) 100-; 14 (1850) 26-.
- Regnault, V.* R. S. P. 6 (1853) 298-.
- Rankine, W. J. M.* (vi *Adds.*) Ph. Mg. 10 (1855) 255-, 334-.
- Regnault, V.* C. R. 50 (1860) 1063-.
- Bloxam, J. C.* [1864] Br. Met. S. P. 2 (1865) 41-.
- Fabian, O.* Carl Rpm. 12 (1876) 397-.
- Mondesir, P. de.* C. R. 90 (1880) 1158-, 1423-.
- Kraevich, K. D.* (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [(Pt. 1)] 141-.
- Sarrau, E.* C. R. 101 (1885) 994-.
- Duhem, P.* C. R. 103 (1886) 1008-.
- Antoine, C.* A. C. 22 (1891) 281-.
- Colot, E.* C. R. 114 (1892) 653-.
- and boiling and freezing points, relations. *König, W.* Frkf. a. M. Ps. Vr. Jbr. (1894-95) 28-.
- of condensed gases. *Bunsen, R. W.* Pogg. A. 46 (1839) 97-.
- curve. *Thiesen, M.* J. Ps. C. 1 (1896-97) 583.
- curves, comparison. *Mondesir, P. de.* C. R. 90 (1880) 860-, 528-.
- and density. *Muncke, G. W.* Schweigger J. 22 (1818) 1-.
- *Grottrian, O., & Willner, A.* A. Ps. C. 11 (1880) 545-.
- formula and law of rectilinear diameter. *Bakker, G.* Z. Ps. C. 18 (1895) 645-.
- at high temperatures. *Nadeždin, A. I.* [1885] Kiev S. Nt. Mm. 8 (1) (1886) lxxxii-.
- of homologous series. *Winkelmann, A. A.* A. Ps. C. 1 (1877) 430-; Lieb. A. 204 (1880) 251-.
- inequality for emission from different states of a substance. *Moutier, J.* Par. S. Phlm. Bil. 2 (1878) 247-.
- influence of change of state. *Ramsay, W., & Young, S.* [1884] Phil. Trans. 175 (1885) 461-.
- electrification. *Blondlot, R.* J. de Ps. 3 (1884) 442-.
- relative volume of liquid and vapour. *Young, S. L.* Ps. S. P. 13 (1895) 271-; Ph. Mg. 88 (1894) 569-.
- traces of impurity. *Tammann, G.* A. Ps. C. 32 (1887) 683-.
- internal, and fundamental equation. *Sandrucci, A.* Rm. R. Ac. Linc. Rd. 3 (1887) (Sem. 1) 489-.
- isobars. *Battelli, A.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 1) 171-.
- isothermals. *Schiller, N.* A. Ps. C. 53 (1894) 396-.
- and latent heat, laws. *Clausius, R.* Pogg. A. 82 (1851) 274-.

## MEASUREMENT.

- Belli, G.* Brescia Cm. (1838) 55-.
- Moser, J.* Berl. Ak. Mb. (1878) 868-.
- Naumann, A.* Berl. B. 11 (1878) 33-.
- Moutier, J.* Par. S. Phlm. Bil. 4 (1880) 86-.
- Lehmann, O.* [1881] (xii) Z. Instk. 2 (1882) 77-.
- Ramsay, W., & Young, S.* C. S. J. 47 (1885) 42-.
- Kahlbaum, G. W. A.* Basel Vh. 9 (1893) 573-; D. Nf. Vh. (1894) (Th. 2, Hälfte 1) 75-; Z. Ps. C. 13 (1894) 14-; 26 (1898) 577-.
- Kelvin, (Lord).* Nt. 55 (1896-97) 295-.
- Gahl, R.* Z. Ps. C. 33 (1900) 178-.
- accuracy of balance method. *Müller-Erzbach, W.* A. Ps. C. 25 (1885) 357-.
- acoustic method. *Doppler, C.* Wien SB. (1849) (Ab. 2) 156-.
- dynamic. *Tammann, G.* A. Ps. C. 33 (1888) 322-.
- and static. *Kahlbaum, G. W. A.* Berl. B. 18 (1885) 3146-.
- — — (Kahlbaum). *Ramsay, W., & Young, S.* Berl. B. 19 (1886) 69-.
- — —. *Kahlbaum, G. W. A.* Arch. Sc. Ps. Nt. 24 (1890) 351-.
- graphical method. *Rankine, W. J. M.* Civing. 12 (1866) 223-.
- by manometer. *Kelvin, (Lord).* Edinb. R. S. P. 21 (1897) 429-.
- microscopical, in very small vessels. *Lehmann, O.* Z. Kr. 12 (1887) 406-.
- by rate of evaporation. *Müller-Erzbach, W.* A. Ps. C. 31 (1887) 1040-.
- — — (Müller-Erzbach). *Schulze, R.* A. Ps. C. 32 (1887) 929-.
- — —. *Müller-Erzbach, W.* A. Ps. C. 34 (1888) 1047-; D. Nf. Vh. (1890) (Th. 2) 18-; Z. Instk. 10 (1890) 88-.
- relation to internal friction. *Heen, P. de.* Brux. Ac. Bil. 10 (1885) 251-.
- strength of electric field. *Sokolov, A. P.* Rs. Ps.-C. S. J. 26 (Ps.) (1894) 311-; Fsch. Ps. (1894) (Ab. 2) 330.
- over solids and liquids. *Fischer, W.* A. Ps. C. 23 (1886) 400-.
- of solids and liquids, transition between. *Ramsay, W., & Young, S.* L. Ps. S. P. 8 (1887) 119-; Ph. Mg. 23 (1887) 61-, 138.
- substance in solid and liquid states. *Ponsot, A.* C. R. 119 (1894) 791-.
- — — — —, apparatus for showing that they are not same. *Gernez, —.* Par. S. Ps. Sé. (1888) 189-.
- — — — — at same temperature. *Ramsay, W., & Young, S.* B. A. Rp. (1884) 622-.
- in terms of critical constants. *Guye, P. A.* [1892] Arch. Sc. Ps. Nt. 29 (1893) 96-.
- theoretical determination. *Rudanowsky, A. P.* Fsch. Ps. (1890) (Ab. 2) 244-.
- in vacuo and in gases. *Regnault, V. C. R.* 39 (1854) 301-, 345-, 397-.
- variation near critical point. *Raveau, —.* Par. S. Ps. Sé. (1893) 57-.

## 1840 Pressure of Vapours

and volume. *Clausius, R. A. Ps. C. 14* (1881) 279-, 692-; *C. R. 93* (1881) 619-.  
 — — — *Lungo, C. del. Rm. R. Ac. Linc. Rd. 7* (1891) (*Sem. 1*) 141-.

### SPECIFIED VAPOURS.

acetic acid. *Moutier, J.* [1880] *Par. S. Phlm. Bll. 5* (1881) 81-.  
 amyl alcohol. *Grassi, G. Nap. Rd. 26* (1887) 148-.  
 argon. *Ramsay, W., & Young, S.* [1895] *Phil. Trans. (A)* 186 (1896) 257-.  
 benzene. *Ferche, J. A. Ps. C. 44* (1891) 265-.  
 carbon dioxide. *Blaserna, P. Rm. R. Ac. Linc. Rd. 2* (1895) (*Sem. 2*) 365-.  
 chloral. *Engel, R., & Moitessier, A. C. R. 90* (1880) 97-.  
 cyanogen. *Chappuis, J., & Rivière, C. C. R. 104* (1887) 1504-; *A. C. 14* (1888) 236-.  
 ether. *Gay-Lussac, L. J. Gilbert A. 29* (1808) 113-.  
 —, table for. *Zeuner, G. Zür. Vjschr. 8* (1863) 160-.  
 ice and water. *Boldrini, C. (vi Adds.) Rm. Cor. So. 4* (1856) 239-.  
 mercury. *Avogadro, A.* [1831] *Tor. Mm. Ac. 36* (1833) 215-.  
 —. *Benedix, A. Pogg. A. 92* (1854) 632-.  
 —. *Regnault, C. C. R. 73* (1871) 1462-.  
 —. *Hagen, E. B. A. Ps. C. 16* (1882) 610-.  
 —. *Hertz, H. R. A. Ps. C. 17* (1882) 193-.  
 —. *Rayleigh, (Lord). B. A. Rp. (1882)* 441-.  
 —. *McLeod, H. B. A. Rp. (1883)* 443-.  
 —. *Ramsay, W., & Young, S. C. S. J. 49* (1898) 37-.  
 —. *Morley, E. W. Am. As. P. (1890)* 91-.  
 — (0° to 100°). *Pfaundler, L. A. Ps. C. 63* (1897) 36-.  
 —. *Cailletet, L., Colardeau, —, & Rivière, —. C. R. 130* (1900) 1585-.  
 —, and its diffusibility. *Biot, —. Mâcon Ac. A. 12* (1895) 108-.  
 —, effect on barometer. *Shortrede, R. As. S. M. Not. 26* (1866) 307-.  
 —, measurement by rate of evaporation. *Müller-Erbach, W. D. Ps. Gs. Vh. (1900)* 127-.  
 organic liquids. *Willner, A. Bonn SB. Niedr. Gs. (1866)* 66-.  
 oxygen. *Estreicher, T. [1895] Krk. Ak. (Mt.-Prz.) Rz. 10* (1896) 140-; *Ph. Mg. 40* (1895) 454-.  
 sulphuric acid. *Perkins, C. A. Am. J. So. 40* (1890) 301-.

### Water Vapour.

*Arzberger, J. Wien Jb. Pol. I. 1* (1819) 144-.  
*Avogadro, A. Brugnattelli G. 2* (1819) 187-.  
*Creighton, W. Tilloch Ph. Mg. 53* (1819) 266-.  
*August, E. F. Pogg. A. 13* (1828) 122-.  
 (at high temperatures.) *Arago, D. F. J., & Dulong, —. Par. Bll. S. Encour. 29* (1830) 295-.

## Water Vapour 1840

(at high temperatures.) *Gérard, —. Edinb. J. So. 3* (1830) 90-.  
 (— — —) *Anon. (vi 593) G. Arcad. 45* (1830) 1-.  
 (— — —) *Dulong, P. L. (vi Adds.) Par. Mm. Ac. So. 11* (1832) 897-.  
*Egen, P. N. C. Pogg. A. 27* (1833) 9-.  
*Biot, J. B. C. R. 12* (1841) 150-.  
 (— 6°·6 to 104°·6 C.) *Magnus, G. Berl. B. (1843)* 282-.  
*Apjohn, Jas. Ir. Ac. P. 2* (1844) 104-.  
*Magnus, G. Pogg. A. 61* (1844) 225-.  
*Majocchi, G. A. (vi Adds.) Majocchi A. Fis. C. 16* (1844) 225-.  
*Regnault, V. A. C. 11* (1844) 273-; *C. R. 18* (1844) 537-.  
 (at low temperatures.) *Muncke, G. W. Pogg. A. 67* (1846) 376-.  
 (about zero.) *Kirchhoff, G. Pogg. A. 103* (1858) 206-.  
 (at zero.) *Moutier, J. Par. S. Phlm. Bll. 12* (1875) 38-.  
*Broch, O. J. Par. Poids et Mes. Tr. Mm. 1* (\*1881) A. 17-.  
 (up to 200 atmospheres.) *Antoine, C. C. R. 113* (1891) 328-.  
*Hinrichs, G. Z. Ps. C. 8* (1891) 680-.  
 (— 50° to +20° C.) *Juhlin, J. [1891] Stockh. Ak. Hndl. Bh. 17 (Afd. 1) (1892) No. 1, 72 pp.; Fachr. Ps. (1891) (Ab. 2) 351-.*  
*Antoine, —. C. R. 116* (1893) 870-.  
 (82° to 100°) *Wiebe, H. F. Z. Instk. 13* (1898) 329-.  
 (below zero.) *Thiesen, M. A. Ps. C. 67* (1899) 690-.  
 (— 12° to +25°.) *Thiesen, M., & Scheel, K. Berl. Ps. Reichsanst. Ab. 3* (1900) 71-.  
 in presence of hygroscopic substances. *Müller-Erbach, W. Carl Rpm. 17* (1881) 652-.  
 Regnault's experiment, temperature determinations in. *Bosscha, J. Amst. Vs. Ak. 5* (1871) (*Nik.*) 332-; *Arch. Néerl. 7* (1872) 117-.  
 —, uncertainty below 100°. *Wild, H. [1893] St. Pét. Ac. Sc. Bll. 36* (1894) 1-.  
 — table, corrections. *Moritz, A. [1854-69] St. Pét. Ac. Sc. Bll. 13* (1855) 41-; 14 (1870) 80-.  
 table for. *Zeuner, G. Sch. Pol. Z. 8* (1863) 1-.  
 —. *Fliegner, A. Civing. 20* (1874) 441-.  
 — — each  $\frac{1}{100}^{\circ}$  from 98° to 101° C. *Crahay, J. G. Brux. Ac. Bll. 15* (1848) (*pte. 2*) 363-.

### PRESSURE TEMPERATURE RELATION FOR SATURATED VAPOURS.

*Tregaskis, R. Edinb. J. So. 10* (1829) 72-.  
*Bary, E. C. R. 20* (1845) 1574-.  
*Russell, J. S. Edinb. R. S. P. 1* (1845) 227-.  
 [Shortrede non] *Shortreed, R. R. S. P. 5* (1848) 738-.  
*Waterston, J. J. B. A. Rp. (1853) (pt. 2) 11-.*  
*Rankine, W. J. M. Ph. Mg. 8* (1854) 580-.  
*Coste, L. M. P. C. R. 43* (1856) 90-.  
*Groshans, J. A. Pogg. A. 104* (1858) 651-.  
*Buff, H. Lieb. A. 2* (1863) (*Suppl. Bd.*) 137-.  
*Nikolai, L. (xii) Kazan Un. Mm. 4* (1868) 497-.



- Herrmann, E. Wien Sb. 64 (1871) (Ab. 2) 623-.
- Massieu, F. C. R. 75 (1872) 872-.
- St. Loup, L. A. C. 27 (1872) 211-.
- Winkelmann, A. A. Münch. Ak. Sb. 9 (1879) 371-; A. Ps. C. 9 (1880) 208-, 358-.
- Pictet, R. C. R. 90 (1880) 1070-.
- Heen, P. de. Brux. Ac. Bil. 11 (1886) 165 (bis)-.
- Koláček, F. A. Ps. C. 29 (1886) 347-.
- Unwin, W. C. L. Ps. S. P. 8 (1887) 22-; Ph. Mg. 21 (1888) 299-.
- Antoine, C. C. R. 107 (1888) 681-, 778-, 886-.
- Bartoli, A., & Stracciati, E. [1889] Catania Ac. Gioen. At. 2 (1890) 1-.
- Saloff, N. de. C. R. 109 (1889) 663-.
- Heen, P. de. Brux. Ac. Bil. 19 (1890) 394-.
- Laar, J. J. van. Z. Ps. C. 11 (1893) 433-.
- Kraevič, K. D. Ph. Mg. 37 (1894) 88-.
- (Kraevič.) FitzGerald, G. F. Ph. Mg. 37 (1894) 89.
- Donnan, F. G. Nt. 52 (1895) 619.
- Bakker, G. [1895] Nt. 53 (1895-96) 79.
- Bogaevskij, L. Rs. Ps.-C. S. J. 29 (Ps.) (1897) 87-; Fsch. Ps. (1897) (Ab. 2) 176.
- Schlemüller, W. Wien Ak. Sb. 106 (1897) (Ab. 2a) 9-.
- Moulin, [H.] Par. S. Ps. Sé. (1900) 160-.
- Biot's law, and law of corresponding boiling points. Mewes, R. Dingler 315 (1900) 424-.
- Dalton's law. Laval, E. Bordeaux S. Sc. Mm. 5 (1883) 107-.
- , modification. Heen, P. de. Brux. Ac. Bil. 9 (1885) 281-.
- Determination of  $\frac{dp}{dt}$ . Perot, A. C. R. 104 (1887) 1366-.
- Deviation from laws of elastic fluids. Waterston, J. J. Ph. Mg. 14 (1857) 279-.
- Dupré and Rankine's formula. Juliusburger, P. A. Ps. 3 (1900) 618-.
- Esters. Nadeždin, A. Exner Rpm. 23 (1887) 759-.
- Regnault's law. Dupré, A. C. R. 58 (1864) 806-.
- Water Vapour.
- Dalton, J. [1801] Manch. Ph. S. Mm. 5 (1802) 535-.
- (Dalton's experiments.) Soldner, J. Gilbert A. 17 (1804) 44-; 25 (1807) 411-.
- Roche, —. QJ. Sc. 2 (1829) 168-.
- Biot, J. B. L'I. 1 (1833) 223-.
- (Dulong's formula.) Spassky, M. Pogg. A. 30 (1833) 331-.
- Farey, J. CE I. T. 1 (1836) 85-.
- Webster, T. CE I. T. 1 (1836) 219-.
- Mossotti, O. F. Mod. S. It. Mm. 21 (1837) 335-.
- Wrede, F. J. Sk. Nf. F. 2 (1840) 242-; Pogg. A. 58 (1841) 225-.
- Strehlke, F. Pogg. A. 58 (1843) 334-.
- Holtzmann, C. H. A. Pogg. A. 67 (1846) 382-.
- Alexander, J. H. Silliman J. 6 (1848) 210-, 317-.
- Rankine, W. J. M. Edinb. N. Ph. J. 47 (1849) 28-.
- Curr, J. B. S. P. 5 (1850) 941-, 960.
- Kessler, F. Danzig Šohr. 6 (Heft 4) (1862) 34 pp. (Alexander's formula.) Potter, R. Ph. Mg. 29 (1865) 98-.
- Edmonds, T. R. Ph. Mg. 29 (1865) 169-.
- Cazin, A., & Hirn, G. A. (ix) Par. S. Phlm. Bil. 4 (1867) 19-.
- Duperray, J. G. C. R. 72 (1871) 723-.
- Morton, A. (x) Glasg. I. Eng. T. 14 (1871) 203-.
- Bertrand, J. C. R. 105 (1887) 389-.
- Kraevič, K. D. Rs. Ps.-C. S. J. 20 (Ps.) (1888) 89.
- Colard, O. Rv. Un. Mines 27 (1894) 106.
- Manaira, A. N. Cim. 1 (1895) 365-.
- Tumlirz, O. Wien Ak. Sb. 105 (1896) (Ab. 2a) 1059-.
- Gnusin, D. Mosc. S. Sc. Bil. 96 (No. 1) (1899) 10-; Fsch. Ps. (1899) (Ab. 2) 376-.
- Pumping hot water. Coles, H. J. I. CE. P. 75 (1884) 211-.
- Saturation, theory of law. Planck, M. A. Ps. C. 13 (1881) 535-.
- SPHEROIDAL STATE.
- Klaproth, M. H. Scherer J. C. 7 (1801) 646-.
- Döbereiner, J. W. A. Gén. Sc. Ps. 4 (1820) 263; Schweigger J. 29 (1820) 43-.
- Muncke, G. W. Pogg. A. 13 (1828) 235-.
- Fischer, N. W. Pogg. A. 19 (1830) 514-; 21 (1831) 163-.
- Muncke, G. W. Pogg. A. 22 (1831) 208-.
- Buff, H. Pogg. A. 25 (1832) 591-.
- Baudrimont, A. A. C. 61 (1836) 319-; C. R. 1 (1836) 290-.
- Laurent, A. C. R. 3 (1836) 149-; A. C. 62 (1836) 327-.
- Boutigny, P. H. Eure Rec. S. Ag. 10 (1839) 862-; C. R. 10 (1840) 397-.
- Desmarest, J. L. J. Phm. 26 (1840) 746-.
- Emsmann, H. Pogg. A. 2 (1840) 444-.
- Boutigny, P. H. Eure Rec. S. Ag. 1 (1841) 167-.
- Marchand, R. F. Erdm. J. Pr. C. 23 (1841) 137-.
- Person, C. C. C. R. 15 (1842) 492-.
- Boutigny, P. H. A. C. 9 (1843) 350-; 11 (1844) 16-.
- (Boutigny.) Belli, G. Mil. I. Lomb. G. 5 (1843) 162-.
- (Matter, fourth state, Boutigny's work.) Bresson, —. (vii) Rouen Bil. S. Ém. (1843) 116-.
- Cima, A. Pisa Misc. Md. Chir. (1843) (pte. 2) 248-.
- Belli, G. Mil. I. Lomb. G. 5 (1844) 399-.
- Fusinieri, A. A. Sc. Lomb. Ven. 13 (1844) 205-.
- Armstrong, W. G. Ph. Mg. 27 (1845) 257-.
- (Boutigny.) Bellani, A. (vi Add.) Majocchi A. Fis. C. 20 (1845) 49-.
- Kersting, R. [1845] (viii) Riga Cor.-Bl. 1 (1846) 147-.

## 1840 Spheroidal State

- Moritz, A. Pogg. A. 72 (1847) 112.  
 Boutan, A. Rouen Tr. Ac. (1848) 82.  
 Légal, J. C. R. 30 (1850) 182-, 451-.  
 Boutigny, P. H. C. R. 31 (1850) 279-.  
 Laroque, F. Toul. Mm. Ac. 6 (1850) 147-.  
 Palmstedt, C. Stockh. Öfv. 7 (1850) 281-.  
 Person, C. C. C. R. 31 (1850) 899-.  
 Schnauss, J. Pogg. A. 79 (1850) 482-.  
 Zantedeschi, F. Zantedeschi A. Fis. (1849-50) 37-.  
 (Boutigny.) Buff, H. Lieb. A. 77 (1851) 1-.  
 Kerckhoff, P. J. van. Pogg. A. 84 (1851) 136-.  
 Laroque, F. Toul. Mm. Ac. 1 (1851) 167-.  
 Nöschel, A. (viii) Riga Cor.-Bl. 4 (1851) 145-, 161-.  
 Poleck, T. Bresl. Schl. Gs. Übs. (1852) 27-.  
 (Boutigny's.) Drame, C. L'I. 21 (1853) 281.  
 Church, A. H. Ph. Mg. 7 (1854) 275-.  
 Boutigny, P. H. J. Phm. 29 (1856) 355-.  
 Delprat, F. A. T. [1857] Utr. Aant. Prv. Gn. (1857-58) 23-.  
 Osann, G. Würzb. Vh. 9 (1859) 52-.  
 Boutigny, P. H. C. R. 50 (1860) 675-.  
 Meunier, S. Presse Sc. 2 (1860) 68-.  
 Artur, J. F. C. R. 53 (1861) 371-.  
 Boutigny, P. H. C. R. 53 (1861) 1062-.  
 Luca, S. de. Pisa A. Un. Tosc. Sc. Cosm. 5 (1858-61) 141-.  
 Berger, —. Pogg. A. 119 (1863) 594-.  
 Demain, S. C. R. 56 (1863) 1103-.  
 Nöschel, A. Riga Cor.-Bl. 15 (1866) 73-.  
 Budde, E. [1869] Bonn SB. Niedr. Gs. 26 (1869) 35-; A. Ps. C. 142 (1871) 158-.  
 Colley, R. A. Ps. C. 143 (1871) 125-.  
 (Budde.) Berger, (Dr.) —. A. Ps. C. 147 (1872) 472-.  
 (Colley.) Berger, (Dr.) —. A. Ps. C. 147 (1872) 474-.  
 Barrett, W. F. [1877] Dubl. S. Sc. P. 1 (1878) 83-.  
 Moss, R. J. [1877] Dubl. S. Sc. P. 1 (1878) 87-.  
 Garnett, W. Nt. 17 (1878) 466.  
 D'yakonov, D. I. (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [Pt. 1] 542-.  
 Luvini, G. Tor. Ac. Sc. At. 19 (\*1883) 579-.  
 Gossart, É. C. R. 104 (1887) 1270-; Caen S. L. Bll. 1 (1887) 75-, 136-; 2 (1888) 97-.  
 Kristensen, K. S. Ts. Ps. C. 27 (1888) 161-; Ph. Mg. 28 (1889) 220.  
 Scheck, —. Kassel Vr. Nt. B. 36 & 37 (1891) 51-.  
 (at 30° C.) Ehrenfeld, C. H. Science 21 (1893) 199-.  
 Pflaum, H. Riga Cor.-Bl. 37 (1894) 105-.  
 Maltzox, C. Athènes Obs. Nat. A. 1 (1896) 231-.  
 Stark, J. A. Ps. C. 65 (1898) 306-.  
 application to analysis of stains from Marsh's apparatus. Boutigny, P. H. C. R. 21 (1845) 1068-.  
 in boilers. Boutigny, P. H. B. A. Rp. (1845) (pt. 2) 27-.  
 ——. Normandy, A. Ph. Mg. 7 (1854) 283-.  
 ——. Witz, A. C. R. 114 (1892) 411-.  
 ——. Swarte, — de. C. R. 114 (1892) 1419-.

## Spheroidal State 1840

- in boilers. Witz, A. C. R. 115 (1892) 38.  
 —, explosions. Campi, (conte) G. (xii) Firenze Ac. Georg. At. 24 (1846) 385-.  
 —, —. Provenzali, F. S. Rm. N. Linc. At. 36 (1883) 175-.  
 —, prevention. Taddei, G. (xii) Firenze Ac. Georg. At. 24 (1846) 339-.  
 cause of travelling motion. Stoney, G. J. B. A. Rp. (1878) 442.  
 drops on heated liquid. Chomel, —. C. R. 19 (1844) 581-.  
 — of melted slag floating on water. Faraday, M. QJ. Sc. 1 (1828) 221-.  
 electric investigation. Gezekhus [Hesekus], N. A. (xii) Rs. C. Ps. S. J. 8 (Ps.) (1876) [Pt. 1] 311-, 356-; (x) A. Ps. C. Beibl. 1 (1877) 449-.  
 — and other properties of bodies in. Wartmann, É. Laus. Bll. S. Vd. 2 (1846-48) 341-.  
 electrification on leaving. Rijke, P. L. Pogg. A. 98 (1856) 500-.  
 evaporation. Person, C. C. Rouen Tr. Ac. (1843) 115-.  
 —. Riddell, J. L. Silliman J. 26 (1858) 71.  
 freezing of water in red hot vessels. West, W. [1845] W. Yorks. P. Gl. S. 2 (1842-48) 285-.  
 heat acquired by water in red hot vessel. Lechevalier, V. J. Phm. 16 (1830) 666-.  
 laws. Boutigny, P. H. C. R. 90 (1860) 1074-.  
 mathematical theory. Gossart, E. C. R. 105 (1887) 518-.  
 mechanical theory. Favé, L. C. R. 84 (1877) 906-.  
 momentary incombustibility of living organic tissue. Boutigny, P. H. C. R. 28 (1849) 593-; A. C. 27 (1849) 54-; C. R. 29 (1849) 471-; J. Phm. 16 (1849) 24-, 424-.  
 — — — — — (Boutigny). Bellani, A. Polli A. 9 (1849) 169-, 222-, 276-; Mil. G. I. Lomb. 2 (1850) 3-.  
 — — — — —. Boutigny, P. H. A. C. 28 (1850) 158-.  
 — — — — — (Bellani). Polli, G. Polli A. 10 (1850) 48-.  
 — — — — —; plunging hand into boiling tar. Davenport, R. Thomson A. Ph. 9 (1817) 111-.  
 — — — — —; — — — molten metal. Come, —. C. R. 90 (1850) 298-.  
 temperature. Peltier, A. Par. S. Phm. PV. (1841) 5-.  
 —. Luca, S. de. N. Cim. 11 (1860) 60-; C. R. 51 (1860) 141-.  
 —. Missaghi, G. N. Cim. 11 (1860) 175-.  
 —. Boutigny, P. H. J. Phm. 39 (1861) 278-.  
 —. Luca, S. de. C. R. 53 (1861) 101-; N. Cim. 13 (1861) 154-; Nap. Rd. 1 (1862) 70-; C. R. 55 (1862) 245-.  
 —. Bell, L. Science 4 (1884) 5.  
 —. Finocchi, E. Rv. Sc.-Ind. 20 (1888) 79-.  
 in vacuo. Laroque, F. Toul. Mm. Ac. 1 (1851) 895-.  
 ——. Luvini, J. C. R. 98 (1884) 1536-.
- State of matter characterised by independence of pressure and specific volume. Heem, P. de. Brux. Ac. Bll. 24 (1892) 267-.

## STEAM.

- Moutier, J.* [1876] Par. S. Phlm. Bll. 1 (1877) 7-.
- cloudy condensation. *Aitken, J.* Nt. 49 (1893-94) 340-.
- — — *Barus, C.* Nt. 49 (1893-94) 363-.
- — — *Bidwell, S.* Nt. 49 (1893-94) 388.
- condensation. *Callendar, H. L., & Nicolson, J. T.* B. A. Rp. (1897) 418-.
- in engines. *Delafond, F.* C. R. 100 (1885) 237-.
- — — *Anon.* Elect. 29 (1892) 593-.
- — — *Donkin, B. (jun.)* Am. Eng. & Railroad J. 67 (1893) 287.
- expansion. *Koch, L.* Franklin I. J. 40 (1860) 378-.
- , adiabatic. *Charpentier, P.* C. R. 98 (1884) 85-, 425-.
- , law. *Tate, T.* CE. I. P. 6 (1847) 343-.
- experiments. *Scrymgeour, J.* Dingler 73 (1839) 321-.
- flow, formulae. *Parenty, H.* C. R. 116 (1893) 1120-.
- , and of mixture of steam and water. *Guzzi, P.* Mil. I. Lomb. Rd. 21 (1888) 725-.
- formation at high temperatures. *Schafhäutl [Pellissov], C. E.* Dingler 71 (1839) 351-; 73 (1839) 81-.
- heating of bodies by contact with. *M'Causeland, R.* Philad. Md. Ps. J. 1 (1805) 110-.
- — liquids by. *Gilbert, L. W.* Gilbert A. 16 (1804) 503-.
- humidity, measurement. *Hirn, G. A.* Civing. 15 (1869) 493-.
- , — *Guzzi, P.* Franklin I. J. 74 (1877) 355-.
- , — *Knight, J. B.* Franklin I. J. 74 (1877) 358-.
- , —, apparatus. *Rateau, —.* A. Mines 11 (1897) 495-.
- , —, — *Goodman, —.* Nt. 62 (1900) 610.
- jets, form, pressure and temperature. *Parenty, H.* C. R. 118 (1894) 183-.
- , rate of condensation. *Palmer, A. de F. (jun.)* Am. J. Sc. 2 (1896) 247-.
- mixture of saturated and surcharged, experiments with. *Ishewood, B. F.* Franklin I. J. 27 (1854) 257-.
- output and coal consumption. *Fischer, F.* Dingler 250 (1883) 72-.
- physical constants. *Schmidt, G.* [1867] Prag Ab. 1 (1868) 50 pp.
- production in relation to heating surface. *Havrez, P.* Cuyper Rv. Un. 11 (1862) 39-.
- properties, mechanical. *Resal, H.* A. Mines 8 (1865) 475-.
- , new. *Lowe, J.* Franklin I. J. 66 (1873) 250-.
- and use. *Burg, A. von. (ix)* Wien Vr. Nw. Kennt. Schr. 12 (1872) 279-.
- Regnault's experiments, rationalisation. *Gray, J. Macfarlane.* I. ME. P. (1899) 399-.
- relation between density and pressure. *Ciccone, L. (xii)* Rv. Sc.-Ind. 18 (1881) 170-.
- saturated, determination of temperature. *Buchanan, J. Y.* [1898] Sc. Met. S. J. 11 (1900) 42-.
- saturated, dryness. *Reynolds, O.* Manch. Lt. Ph. S. Mm. & P. 41 (1897) No. 3, 14 pp.
- , mechanical properties. *Antoine, C.* C. R. 80 (1875) 435-.
- scalding effect at 100°. *Kaeuffer, P.* A. Gén. Civ. 6 (1867) 273-.
- surface condensation. *Joule, J. P.* [1860] Phil. Trans. (1861) 133-.
- total heat. *Joule, J. P.* [1859] Manch. Ph. S. Mm. 1 (1862) 99-.
- as vehicle for conveying heat from one place to another. *Rumford, B. (Count).* R. I. J. 1 (1802) 34-.
- volume and pressure. *Pambour, F. M. G. de.* C. R. 6 (1838) 373-.
- — — (Pambour). *Biot, J. B.* C. R. 6 (1838) 389-, 509.
- — — *Pambour, F. M. G. de.* C. R. 6 (1838) 508-; 12 (1841) 655-, 766-.
- Temperature produced by vapour, and temperature of vapour. *Faraday, M. A. C.* 20 (1822) 320-.
- Toricellian vacuum. *Moser, J.* [1876] A. Ps. C. 160 (1877) 138-.
- — over fatty oil. *Hildebrandt, G. F.* Schweigger J. 1 (1811) 41-.
- — — water. *Hildebrandt, G. F.* Gehlen J. 9 (1810) 541-.

## VAPOURS.

- Rankine, W. J. M.* [1865] Edinb. R. S. P. 5 (1866) 449-.
- adiabatic relation. *Resal, H.* C. R. 75 (1872) 1475.
- behaviour. *Puschl, K.* [1874-91] Wien Ak. Sb. 70 (1875) (Ab. 2) 571-; 100 (1891) (Ab. 2a) 843-.
- calorimetric study. *Mathias, E.* Toul. Fac. Sc. A. 10 (1896) E, 52 pp.
- expansion. *Tregaskis, R.* Edinb. J. Sc. 10 (1829) 68-.
- *Clausius, R.* Pogg. A. 82 (1851) 263-.
- *Cazin, A.* C. R. 62 (1866) 56-.
- *Rankine, W. J. M.* Ph. Mg. 31 (1866) 197-.
- and compression. *Zeuner, G.* Zür. Vjschr. 8 (1863) 68-.
- — — *Cazin, A.* C. R. 66 (1868) 1152-; A. C. 14 (1868) 374-.
- curves. *Fliegner, A.* Zür. Vjschr. 29 (1884) 226-.
- in liquids. *Cantoni, G.* Mil. I. Lomb. Rd. 8 (1875) 174-; Rm. R. Ac. Linc. T. 3 (1879) 223-.
- maximum elasticity and density. *Morton, A.* [1876] Glasg. Ph. S. P. 10 (1877) 236-.
- mechanical properties. *Antoine, C.* C. R. 81 (1875) 574.
- and mixtures of vapours. *Plücker, J.* Pogg. A. 92 (1854) 193-.
- nature, apparatus to illustrate. *Gutkovskij, N. K.* Rs. Ps.-C. S. J. 16 (Ps.) (1884) 567-.
- pressure-regulator for. *Arsonval, A. d'.* C. R. 91 (1880) 1063-.

- properties. *Lardner, D.* R. S. P. 3 (1832) 159-.
- , apparatus for shewing. *Fonseca Benevides, F. da.* Lisb. J. Sc. Mth. 2 (1870) 189-; A. C. 20 (1870) 204-.
- , —. *Bleekrode, L. A.* Ps. C. 152 (1874) 634-.
- temperatures at low pressure. *Kahlbaum, G. W. A.* Basel Vh. 8 (1890) 363-.
- theory. *Bellani, A.* Brugnatelli G. 2 (1809) 413-, 501-.
- , *Dauriac, M.* N. A. Mth. 3 (1844) 127-.
- , *Zeuner, G.* Pogg. A. 110 (1860) 371-.
- thermal properties. *Mathias, E.* C. R. 126 (1898) 1095-; Toul. Fac. Sc. A. 12 (1898) E, 17 pp.
- , alcohol. *Battelli, A.* [1893] Tor. Ac. Sc. Mm. 44 (1894) 57-.
- , carbon disulphide. *Battelli, A.* Tor. Ac. Sc. Mm. 42 (1892) 119-.
- , — and water. *Battelli, A.* Tor. Ac. Sc. Mm. 41 (1891) 25-.
- , ether. *Ramsay, W., & Young, S.* [1896] Phil. Trans. (A) 178 (1898) 57-.
- , —. *Battelli, A.* Tor. Ac. Sc. Mm. 40 (1890) 21-.
- , methyl alcohol. *Ramsay, W., & Young, S.* [1887] Phil. Trans. (A) 178 (1888) 313-.
- , propyl alcohol. *Ramsay, W., & Young, S.* [1888-89] Phil. Trans. (A) 180 (1890) 137-.
- , water vapour. *Battelli, A.* [1892] Tor. Ac. Sc. Mm. 43 (1893) 63-.
- vesicular nature. *Lenglet, L.* C. R. 48 (1859) 1048-.
- , experiment relating to. *Plateau, J. A. F.* Brux. Ac. Bll. 32 (1871) 251-.
- volume, specific heat, etc. *Antoine, C.* C. R. 103 (1886) 1242-.
- Volatile compound liquids, properties and use in refrigeration. *Pictet, R.* [1885] Laus. S. Vd. Bll. 21 (1886) xix.
- Water, boiling and distillation, influence of draught of air. *Howitz, F. G.* Schweigger J. 41 (= *Jb.* 11) (1824) 293-.
- , state in atmosphere. *Gough, J.* [1803] Manch. Ph. S. Mm. 1 (1805) 296-.
- , from steam, measurement. *Ferraris, G.* Tor. Ac. Sc. At. 17 (1881) 135-.
- , and steam, properties. *Ramsay, W., & Young, S.* [1891] Phil. Trans. (A) 183 (1893) 107-.

## 1850 Vapour Densities.

(See also 0810 and Chemistry 7115.)

- Herwig, H.* Bonn. SB. Niedr. Gs. (1869) 172-.
- Antoine, C.* C. R. 107 (1888) 1143-.
- Apparent and real vapour densities of compounds. *Wanklyn, J. A., & Robinson, J.* (viii) Ph. Mg. 26 (1863) 545-.
- Calculation, tables for. *Brown, J. T.* C. S. J. 4 (1866) 72-; 8 (1870) 323-.

- Densities of liquefied gases and saturated vapours. *Cailletet, L., & Mathias, —.* C. R. 102 (1886) 1202-; Par. S. Ps. S6. (1886) 171-.
- liquids and their saturated vapours at point of transition. *Waterston, J. J.* B. A. Rp. (1853) (pt. 2) 11.
- General law. *Waterston, J. J.* [1851] Phil. Trans. (1852) 83-.
- Gradient of density. *Waterston, J. J.* B. A. Rp. (1852) (pt. 2) 2.

## MEASUREMENT.

- Croullebois, M.* C. R. 78 (1874) 496-.
- (Croullebois.) *Sainte-Claire Deville, É. H.* C. R. 78 (1874) 534-.
- (Sainte-Claire Deville.) *Croullebois, M.* C. R. 78 (1874) 805-.
- Nilson, L. F., & Pettersson, O.* Stockh. Ak. Hndl. Bh. 11 (1887) No. 6, 16 pp.
- Agamemone, G.* Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 30-.
- Golicyn, B. B.* Mosc. S. Sc. Bll. 73 (No. 2) (1891) 5-; Fsch. Mth. (1891) 1188-; A. Ps. C. 47 (1892) 466-.
- Bauer, G.* A. Ps. C. 55 (1895) 184-.
- in barometric vacuum. *Hofmann, A. W. D.* C. Gs. B. 1 (1868) 198-.
- , Hofmann's method. *Gabba, L.* Mil. I. Lomb. Rd. 2 (1869) 50-.
- , —. *Tilden, W. A.* C. N. 87 (1878) 219.
- , —. *Bell, C. A., & Teed, F. L.* C. S. J. 37 (1880) 576-.
- near critical point. *Heen, P. de.* Brux. Ac. Bll. 31 (1896) 147-.
- high boiling substances. *Klobukow, N. von.* A. Ps. C. 22 (1884) 493-.
- by level-manometer. *Toepler, M.* A. Ps. C. 57 (1896) 311-.
- liquefied gases and their saturated vapours. *Amagat, É. H.* C. R. 114 (1892) 1093-, 1322-.
- liquids and saturated vapours. *Hirsch, R. (Frhr.) von.* A. Ps. C. 69 (1899) 456-, 837.
- low boiling substances. *Klobukow, N. von.* A. Ps. C. 22 (1884) 465-.
- under reduced pressure. *Schall, C.* Berl. B. 22 (1889) 140-; 23 (1890) 919-; 25 (1892) 1489-; J. Pr. C. 45 (1892) 134-; 62 (1900) 586-.
- and velocity of sound. *Jaeger, W.* A. Ps. C. 36 (1889) 165-.

- Solvents, density, in relation to solidifying and boiling points. *Raoult, F. M.* C. R. 117 (1893) 833-.
- Specific volume of liquids and vapours. *Groschans, J. A.* A. Ps. C. 61 (1897) 780-.
- and pressure of saturated vapours. *Lungo, C. del.* A. Ps. C. 42 (1891) 344-.
- , —. *Moulin, H.* C. R. 180 (1900) 1454-.
- of saturated vapours, measurements. *Perot, A.* A. C. 13 (1888) 145-; 7 (1896) 574.
- , —, relation to that of their liquids and to temperature. *Jäger, G.* Wien Ak. Sb. 99 (1891) (Ab. 2a) 1028-.

## 1860 Ebullition

### SPECIFIED SUBSTANCES.

- Ammonium sulphide. *Salet, G.* C. R. 86 (1878) 1080-.
- Carbon dioxide, density curves. *Amagat, E. H.* C. R. 131 (1900) 91-.
- Ethyl oxide. *Ramsay, W., & Young, S.* [1886] Phil. Trans. (A) 178 (1888) 57-.
- Methyl alcohol. *Ramsay, W., & Young, S.* [1887] Phil. Trans. (A) 178 (1888) 313-.
- Propyl alcohol. *Ramsay, W., & Young, S.* [1888-89] Phil. Trans. (A) 180 (1890) 137-.
- Steam, density, latent heat and elasticity. *Southern, J.* [1814] Ph. Mg. 30 (1847) 113-.
- , influence of hygroscopic character of glass on determination of density. *Grimaldi, G., & Macaluso, D.* Rm. R. Ac. Linc. T. 6 (1882) 264-.
- , saturated. *Edmonds, T. R.* Ph. Mg. 30 (1865) 1-.
- , —. *Hill, J. W.* V. Nost. Eng. Mg. 18 (1878) 558-.
- , —, calculation of density. *Clausius, R.* A. Ps. C. 124 (1865) 345-.
- , — at 0° C., specific volume. *Dieterici, C.* Berl. Ps. Gs. Vh. (1889) 46-; A. Ps. C. 38 (1889) 1-, 676.
- Sulphur dioxide as liquid and as saturated vapour. *Cailletet, L., & Mathias, E.* C. R. 104 (1887) 1563-; Par. S. Ps. 86. (1887) 162-.
- — — — — (Cailletet and Mathias). *Bertrand, —.* C. R. 104 (1887) 1568-.
- Water, carbon disulphide and ether, specific volumes. *Perot, A.* Franklin I. J. 133 (1892) 55-, 93-.
- and steam, some properties. *Ramsay, W., & Young, S.* [1891] Phil. Trans. (A) 183 (1893) 107-.

## 1860 Ebullition.

- Bellani, A.* Brugatelli G. 2 (1809) 413-, 501-; 3 (1810) 26-.
- Prevost, B.* Bb. Un. 6 (1817) 15-.
- Dufour, C.* Moigno Cosmos 18 (1861) 650-.
- Dufour, L.* Bb. Un. Arch. 12 (1861) 210-; C. B. 52 (1861) 986-; 53 (1861) 846-.
- Pless, F.* Wien Sb. 54 (1866) (Ab. 2) 75-.
- Tomlinson, C.* Ph. Mg. 37 (1869) 161-.
- Gernex, D.* A. C. 4 (1875) 335-.
- Tomlinson, C.* Ph. Mg. 49 (1875) 432-; 50 (1875) 85-.
- Egyed, M.* (xii) Kolozsvár Orv.-Term. Társ. Éts. [1] (1876) (Term. Szak) [25]-.
- Grassi, G.* Mil. I. Lomb. Rd. 13 (1880) 247-; Nap. I. Inc. At. 1 (1882) No. 5, 5 pp.
- acceleration by electricity. *Cintoletti, F.* (xii) Rv. Sc.-Ind. 7 (1875) 312-.
- and adhesion to containing vessel. *Louyet, P.* Brux. Ac. Bil. 15 (1848) (pte. 2) 27-.
- assisted by solid nuclei. *Tomlinson, C.* R. S. P. 17 (1869) 240-.
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- Cryogenic Laboratory, Leyden, methods and apparatus. *Kamerlingh Onnes, H.* Amst. Ak. Vs. 8 (1900) 125-, 256, 480-; *Amst. Ak. P.* 2 (1900) 129-, 437-.
- Dalton's law of pressure for mixed gases, deviation from. *Marquies, M.* Wien Ak. Sb. 98 (1890) (Ab. 2a) 883-.
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- Liquefiable gases, elastic force. *Melons, H. L. F.* Brux. Ac. Bil. 29 (1870) 702-.
- Liquefied gases. *Devar, J.* [1884] R. I. P. 11 (1887) 148-.
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- and production. *Dommer, F.* Rv. Sc. 11 (1899) 385-.
- *Anon.* [1899] Sc. Abs. 3 (1900) 107.
- behaviour. *Wroblewski, S.* Wien Ak. Sb. 92 (1886) (Ab. 2) 639-; *Mh. C.* (1885) 621-.
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- liquefaction. *Cailletet, L., & Hautefeuille, P.* C. R. 92 (1881) 901-.
- *Kuenen, J. P.* Amst. Ak. Vs. 3 (1895) 90-; *Arch. Néerl.* 1 (1898) 331-.
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- Seleniuretted hydrogen, physical properties at low temperature and under pressure. *Olzowski, K.* Krk. Ak. (Mt.-Prz.) Rz. 20 (1890) 282-; Crc. Ac. Sc. Bl. (1890) 57-.
- Solidification of gases. *Mareska, J.* Brux. Ac. Bl. 10 (1843) 75-.
- — nitrogen and temperature obtained by means of boiling oxygen. *Wroblewski, S. von.* C. R. 97 (1868) 1553-.

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- Acetylene. *Cailletet, L.* C. R. 85 (1877) 851-.
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- , liquefaction by expansion. *Claude, G. C.* R. 131 (1900) 500-.
- , — — Linde's method. *Ewing, J. A.* Sc. Abs. 1 (1898) 396-.
- , — and oxygen making, theory of Linde's method. *Lorenz, H.* Civing. 41 (1895) 633-.
- , — by self-intensive refrigeration. *Hampson, W.* Nt. 55 (1896-97) 465-.
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- Carbon dioxide. *Ridolfi, C.* Brugnatelli G. 6 (1823) 455-.
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- , liquefaction and solidification. *Mitchell, J. K.* Franklin I. J. 22 (1838) 289-.
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- — and oxygen. *Cailletet, L.* C. R. 85 (1877) 1213-.
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- antimonide, liquefaction and solidification. *Olzowski, K.* Krk. Ak. (Mt.-Prz.) Rz. 15 (1887) 211-.
- and helium. *Dewar, J.* C. R. 126 (1898) 1408-, 1538.
- , liquefaction, possibility. *Wroblewski, S.* C. R. 98 (1884) 304-.
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- Hydrogen, liquefaction and solidification, Pictet's experiments. *Krzyzanowski, K.* [1889] Krk. Ak. (Mt.-Prz.) Rz. 20 (1890) 1-; Crc. Ac. Sc. Bl. (1889) No. 1, xxviii-.
- , —, thermodynamic uniformity and use of vacuum vessels. *Kamerlingh Onnes, —.* Amst. Ak. Vs. 4 (1896) 236-, 271-.
- Nitrogen dioxide. *Cailletet, L.* C. R. 85 (1877) 1016-.
- — and methane, liquefaction and solidification. *Olzowski, K.* C. R. 100 (1885) 940-.
- and ethylene, liquefaction under very small pressures. *Olzowski, K.* C. R. 99 (1884) 133-.
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- and hydrogen. *Pictet, R.* Arch. Sc. Ps. Nt. 61 (1878) 16-.
- , liquefaction by ethylene. *Cailletet, L.* C. B. 100 (1885) 1033-; Par. S. Ps. Sé. (1885) 71-.
- and nitrogen. *Olzowski, K., & Wroblewski, S. von.* C. R. 96 (1883) 1140-, 1225-.
- — — and carbonic oxide. *Olzowski, K., & Wroblewski, S. von.* A. Ps. C. 20 (1883) 243-.
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- Propylene, trimethylene and allylene. *Molchanovskij, N. V.* [1888] Kiev S. Nt. Mm. 10 (1889) xci-.

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### CHARACTERISTIC EQUATIONS.

- Waals, J. D. van der.* [1896] Amst. Ak. Vs. 5 (1897) 150-; Fachr. Ps. (1896) (Ab. 2) 199-.
- Berthelot, D.* Arch. Néerl. 5 (1900) 417-, 679.
- constant 'b' of van der Waals. *Guye, P. A.* Arch. Sc. Ps. Nt. 23 (1890) 197-.
- — van der Waals's law, significance. *Boltzmann, —, & Mache, —.* Camb. Ph. S. T. 18 (1900) 91-.
- covolume in. *Berthelot, D.* C. R. 130 (1900) 115-.
- of gases in relation to solutions. *Jüger, G.* Wien Ak. Sb. 101 (1892) (Ab. 2a) 553-.
- internal pressure term in van der Waals's and Clausius's formulæ. *Berthelot, D.* C. R. 130 (1900) 69-.
- and law of corresponding states. *Raveau, C.* Par. S. Ps. Sé. (1896) 274-.
- new. *Amagat, E. H.* C. R. 128 (1899) 538-.
- , saturation case. *Amagat, E. H.* C. R. 128 (1899) 649-; Par. S. Ps. Sé. (1899) 51-.



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- theories of van der Waals. *Guye, P. A.* Arch. Sc. Ps. Nt. 23 (1889) 540-.
- of van der Waals. *Kracvič, K.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 1-; J. de Ps. 7 (1888) 271.
- — — (isothermal). *Korteweg, D. J.* Nt. 45 (1892) 152-, 277.
- — — *Boltzmann, L.* Amst. Ak. Vs. 7 (1899) 477-; Amst. Ak. P. 1 (1899) 398-.
- — — (*Boltzmann*). *Waals, J. D. van der.* Amst. Ak. Vs. 7 (1899) 537-; Amst. Ak. P. 1 (1899) 468-.

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- limit of liquid state. *Hannay, J. B.* R. S. P. 31 (1881) 520-; 33 (1882) 294-; Nt. 26 (1882) 370.
- liquid and gaseous. *Andrews, T.* Phil. Trans. 159 (1869) 575-.
- — — *Thomson, (Prof.) James.* [1871] R. S. P. 20 (1872) 1-.
- — — *Waals, J. D. van der.* [1873] (xi) A. Ps. C. Beibl. 1 (1877) 10-.
- — — *Andrews, T.* R. S. P. 23 (1875) 514-.
- — — *Bouty, E.* J. de Ps. 6 (1877) 368-.
- — — *Walter, A.* D. Nt. B. (\*1877) 106-.
- — — *Hannay, J. B.* C. R. 92 (1881) 1836-.
- — — *Ramsay, W., & Young, S.* R. S. P. 42 (1887) 3-.
- — — (Clausius's formula for change). *Fitz-Gerald, G. F.* R. S. P. 42 (1887) 216-.
- — — *Nadeždin, A.* Exner Rpm. 23 (1887) 617-, 685-.
- — — (transition at all temperatures). *Ramsay, W., & Young, S.* L. Ps. S. P. 8 (1887) 194-; Ph. Mg. 23 (1887) 435-; L. Ps. S. P. 9 (1888) 33-; Ph. Mg. 24 (1887) 196-.
- — — *Ramsay, W., & Young, S.* Ph. Mg. 23 (1887) 547-.
- — — *Duhem, P.* Lille Tr. Mm. 1 (1889-91) Mém. 5, 105 pp.
- — — *Ramsay, W.* [1891] R. I. P. 13 (1893) 365-.
- — — *Sarrau, E.* Rv. Sc. 48 (1891) 97-.
- — —, in isothermal transformation. *Preston, T.* Dubl. S. So. T. 6 (1898) 119-.
- — — and solid. *Thomson, (Prof.) James.* [1871-73] B. A. Rp. 41 (1871) (Sect.) 31-; 42 (1872) (Sect.) 24-; R. S. P. 22 (1873-74) 27-.
- — — solid. *Barus, C.* Am. J. Sc. 42 (1891) 125-.
- — — *Heydweiller, A.* A. Ps. C. 64 (1898) 725-.

- Critical coefficient and constitution at critical point. *Guye, P. A.* Par. S. Ps. Sé. (1890) 39-.
- — — formula  $\frac{n-1}{d}$ . *Nazini, R.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 2) 127-.
- — — constant and molecular refraction, relation. *Guye, P. A.* Par. S. Ps. Sé. (1890) 17-.

## Critical Constants 1880

### CRITICAL CONSTANTS.

- of carbon dioxide. *Amagat, E. H.* C. B. 114 (1892) 1093-, 1322-; Par. S. Ps. Sé. (1892) 242.
- 2 classes of curves connecting. *Mathias, E.* C. R. 130 (1900) 1748-; Par. S. Ps. Sé. (1900) 165-.
- determination. *Cailletet, L., & Colardeau, E.* C. R. 112 (1891) 563-.
- *Mathias, E.* [1900] Sc. Abs. 4 (1901) 378-.
- of gases. *Leduc, A., & Sacerdote, P.* C. R. 125 (1897) 397-.
- hydrochloric acid and methyl chloride vapours. *Vincent, C., & Chappuis, J. C.* R. 100 (1885) 1216-.
- nitrogen. *Olszewski, K.* C. R. 98 (1884) 918-.
- vapours. *Vincent, C., & Chappuis, J. C.* R. 101 (1885) 427-.

- Critical data of liquids. *Heilborn, E.* Z. Ps. C. 7 (1891) 601-.
- — — and chemical constitution. *Heilborn, E.* Z. Ps. C. 6 (1890) 578-.
- — — Pennsylvanian paraffins. *Bartoli, A., & Stracciati, E.* N. Cim. 16 (1884) 104-.
- Critical density, determination. *Mathias, E.* C. R. 115 (1892) 35-.
- — — *Young, S., & Thomas, G. L.* L. Ps. S. P. 12 (1894) 134-; Ph. Mg. 34 (1892) 507-.
- — —, law of Cailletet and Mathias. *Young, S. L.* Ps. S. P. 17 (1901) 490-; Ph. Mg. 50 (1900) 291-.
- — —, supposed existence. *Heen, P. de.* Brux. Ac. Bl. 33 (1897) 119-.
- — — and theory of corresponding states. *Mathias, E.* Toul. Fac. Sc. A. 6 (1892) M. 34 pp.
- isothermal line and densities of saturated vapour and liquid in isopentane and carbon dioxide. *Verschaffelt, J. E.* Amst. Ak. Vs. 8 (1900) 651-; Amst. Ak. P. 2 (1900) 588-.
- phenomena. *Zambiasi, G.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 1) 21-.
- — —, influence of curvature in surface at high temperatures. *Waals, J. D. van der.* Amst. Ak. Vs. 3 (1895) 133-.
- — — gravity. *Kuener, J. P.* Amst. Ak. Vs. 4 (1896) 41-; Arch. Néerl. 1 (1898) 342-.

### CRITICAL POINT.

- Cagniard-Latour, (le baron) C.* A. C. 21 (1822) 127-; 22 (1823) 410-; 23 (1823) 267-.
- Ramsay, W.* [1880] R. S. P. 31 (1881) 194-.
- Nadeždin, A. I.* (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [(Pt. 1)] 157-, 538-; 15 (Ps., Pt. 1) (1883) 25-; (x) A. Ps. C. Beibl. 7 (1883) 678-.
- Jamin, J. C.* C. R. 96 (1883) 1448-.
- (priority claim.) *Ramsay, W.* C. R. 97 (1883) 448-.

## 1880 Critical Point

adiabatic expansion near. *Natanson, W.* *Krk. Ak. (Mt.-Prz.)* Rz. 8 (1895) 220-; *Cro. Ac. Sc. Bll.* (1895) 130-.

adiabatics of system of liquid and gas. *Raveau, C.* *Par. S. Ps. Sé.* (1892) 266-.

anomalies. *Kuener, J. P.* *Amst. Ak. Vs.* [2] (1894) 85-; *Arch. Néerl.* 1 (1898) 274-.

—, experiments. *Kuener, J. P.* *Amst. Ak. Vs.* 3 (1895) 19-, 57-; *Arch. Néerl.* 1 (1898) 279-.

behaviour near. *Golicyn, B. A.* *Ps. C.* 50 (1898) 521-.

— at. *Gouy, —.* *C. R.* 116 (1898) 1289-.

capillarity near (carbon dioxide). *Verschaffelt, J.* *Amst. Ak. Vs.* 5 (1897) 94-; *J. de Ps.* 6 (1897) 445-.

— —. *Eldik, A. van.* [1897] *Amst. Ak. Vs.* 6 (1898) 13-, 74-; *J. de Ps.* 7 (1898) 159-.

— —. *Bakker, G. Z.* *Ps. C.* 35 (1900) 598-.

of carbon dioxide. *Garnett, W.* *Nt.* 16 (1877) 23.

condensation at. *Fuchs, K.* *Exner Rpm.* 26 (1890) 497-.

determination. *Guldberg, C. M.* *Christiania F.* (1882) No. 20, 10 pp.

— —. *Pellat, H.* *J. de Ps.* 1 (1892) 225-.

—, Cailletet and Colardeau's method. *Grimaldi, G. P.* *Rm. R. Ac. Linc. Rd.* 1 (1892) (Sem. 1) 79-.

—, criterion. *Dickson, J. D. H.* *Ph. Mg.* 10 (1880) 40-.

— of density near. *Heen, P. de.* *Brux. Ac. Bll.* 31 (1896) 147-.

— — volumes of liquids and vapours above. *Heen, P. de.* *Brux. Ac. Bll.* 27 (1894) 580-.

effect of weight on fluids at. *Gouy, —.* *C. R.* 115 (1892) 720-.

electric conductivity at. *Bartoli, A.* *Rm. R. Ac. Linc. Rd.* 2 (1886) (Sem. 2) 129-.

errors for pure substances and mixtures. *Hirsch, R. von.* *A. Ps.* 1 (1900) 655-.

of ethyl ether, refractivity near. *Golicyn, B., & Wilip, J.* *St. Pét. Ac. So. Bll.* 11 (1900) 117-.

lecture experiment. *Barus, C.* *Am. J. So.* 2 (1896) 1-.

meniscus formation, influence of time. *Heen, P. de.* *Brux. Ac. Bll.* 25 (1893) 14-.

of mixed gases. *Ansdell, G.* [1882] *B. S. P.* 34 (1883) 113-.

— some organic compounds. *Altschul, M. Z.* *Ps. C.* 11 (1893) 577-.

phenomena. *Zambiasi, G.* *Rm. R. Ac. Linc. Rd.* 1 (1892) (Sem. 2) 423-.

physical state near. *Cailletet, L., & Colardeau, E.* *C. R.* 108 (1889) 1280-.

properties of liquids near. *Golicyn, B. B.* *St. Pét. Ac. So. Bll.* 10 (1899) xxxiv-.

— — pure gases near. *Villard, P.* *Par. S. Ps. Sé.* (1894) 244-.

— — — (Villard). *Wesendonck, K. A.* *Ps. C.* 55 (1895) 577-.

state of matter near. *Cailletet, L., & Colardeau, E.* *A. C.* 18 (1889) 269-.

## Critical State 1880

state of matter near. *Lepsius, B.* *Frkf. a. M. Ps. Vr. Jbr.* (1890-91) 27.

— — — at. *Battelli, A.* *Ven. I. At.* (1891-92) 1615-; (1892-93) 685-.

— — — near. *Dwelschawers-Dery, F. V.* *Brux. Ac. Bll.* 30 (1895) 570-.

and vapour pressure of water. *Cailletet, L., & Colardeau, E.* *C. R.* 112 (1891) 1170-; *Par. S. Ps. Sé.* (1891) 172-.

variation in vapour pressure near. *Raveau, —.* *Par. S. Ps. Sé.* (1893) 57-.

Critical pressure, calculation. *Dutoit, P., & Friderich, L.* *Arch. So. Ps. Nt.* 5 (1898) 574-.

— — of ice. *Butlerow, A.* *St. Pét. Ac. So. Bll.* 27 (1881) 273-.

— — for solids, so-called. *Richter, — von.* *Bresl. Schl. Gs. Jbr.* (1885) 132-.

— solution point, influence of pressure. *Lee, N. J. van der.* *Z. Ps. C.* 33 (1900) 622-.

### CRITICAL STATE.

*Ramsay, W.* *R. S. P.* 30 (1880) 823-.

*Stolyetov, A. G.* (xii) *Ra. Ps.-C. S. J.* 14 (Ps.) (1882) [(Pt. 1)] 167-; (xi) *J. de Ps.* 1 (1882) 543-.

(*Stolyetov.*) *Zatonchewskit, V.* (xii) *Rs. Ps.-C. S. J.* 14 (Ps.) (1882) [(Pt. 1)] 386-.

*Stolétov, A. G.* *Mosc. S. So. Bll.* 78 (No. 1) (1892) 1-; *Fachr. Ps.* (1892) (Ab. 2) 190-; *Rs. Ps.-C. S. J.* 25 (Ps.) (1893) 303-; 26 (Ps.) (1894) 26-; *J. de Ps.* 3 (1894) 571-; 4 (1895) 579.

*Battelli, A.* *Rm. R. Ac. Linc. Rd.* 2 (1893) (Sem. 1) 171-.

*Ramsay, W.* *Z. Ps. C.* 14 (1894) 486-.

*Wesendonck, K.* *Z. Ps. C.* 15 (1894) 262-.

*Zambiasi, G.* *Rm. R. Ac. Linc. Rd.* 4 (1895) (Sem. 2) 127-.

*Dieterici, C. A.* *Ps. C.* 69 (1899) 685-; *Ps. Z.* 1 (1900) 73-.

accidental character. *Heen, P. de.* *Brux. Ac. Bll.* 27 (1894) 343-.

carbon dioxide, coloured by iodine. *Villard, P.* *Par. S. Ps. Sé.* (1894) 242-.

condensation in mixtures near. *Hartman, C. M. A.* [1900] *Amst. Ak. Vs.* 9 (1901) 60-; *Amst. Ak. P.* 3 (1901) 66-.

theory. *Reis, P.* *Humb.* 7 (1888) 369-, 409-.

### CRITICAL TEMPERATURES.

*Moutier, J.* *Par. S. Phlm. Bll.* 2 (1878) 75-.

*Pawlewski, B.* *Berl. B.* 15 (1882) 460-.

*Nadeždin, A. I.* [1885] *Kiev S. Nt. Mm.* 8 (1) (1886) 1.

*Prytz, K.* *Ts. Ps. C.* 26 (1887) 33-.

*Golicyn, B. B.* *Rs. Ps.-C. S. J.* 22 (Ps.) (1890) 265-; *Fachr. Ps.* (1890) (Ab. 2) 248-; *J. de Ps.* 1 (1892) 474-.

*Ladenburg, —.* *Bresl. Schl. Gs. Jbr.* (1890) (Al. B.) 20-.

*Bulatov, A.* *Rs. Ps.-C. S. J.* 31 (Ps.) (1899) 69-.

behaviour near. *Clark, J. W.* [1880] *L. Ps. S. P.* 4 (1881) 41-; *Ph. Mg.* 10 (1880) 145-.

1880 *Critical Temperatures*

- and boiling point. *Bartoli, A.* N. Cim. 16 (1884) 74-; 20 (1886) 189-.
- — —, hydrogen. *Olazewski, K.* Krk. Ak. (Mt.-Prz.) Rz. 9 (1895) 404-; Ph. Mg. 40 (1895) 202-.
- causes underlying. *Avenarius, M.* [1876] St. Pét. Ac. Sc. Bll. 22 (1877) 878-.
- change of state near. *Cailletet, L., & Haute-feuille, P.* C. R. 92 (1881) 840-.
- and change of state. *Walterhöfer, O.* Humb. 5 (1886) 404-.
- of compound esters. *Pawlewski, B.* (xii) Kosmos (Lw.) 7 (1882) 1-, 180-, 303-; (x) Berl. B. 15 (1882) 2460-; 16 (1883) 2633-.
- — — (Pawlewski). *Nadeždin, A.* Rs. Ps.-C. S. J. 16 (Ps.) (1884) 74-.
- as criterion of chemical purity. *Altschul, M.* Berl. Ps. Gs. Vh. (1895) 1-.
- — — —. *Pictet, R.* C. R. 120 (1895) 43-.
- determination. *Golicyn, B. B.* Mosc. S. Sc. Bll. 73 (No. 2) (1891) 5-; Fsohr. Mth. (1891) 1188-.
- *Chappuis, J.* C. R. 118 (1894) 976-.
- in opaque tubes. *Nadeždin, A. I.* [1885] Kiev S. Nt. Mm. 8 (1) (1886) xvii-; St. Pét. Ac. Sc. Bll. 30 (1886) 327-.
- of volume of liquid at. *Žuk, K. N.* [1885] Kiev S. Nt. Mm. 8 (1) (1886) xviii-.
- of hydrogen. *Natanson, W.* Krk. Ak. (Mt.-Prz.) Rz. 7 (1895) 374-; Cro. Ac. Sc. Bll. (1895) 98-.
- liquid, influence of pressure of gas. *Schiller, N. N.* [1894] Kiev S. Nt. Mm. 15 (1) (1896) lix-.
- mixtures. *Straus, O. E.* (xii) Rs. Ps.-C. S. J. 12 (Ps.) (1890) [(Pt. 1)] 207-.
- physical state at. *Guye, P. A.* C. R. 110 (1890) 141-.
- and pressure. *Engel, R.* Rv. Sc. 3 (1882) 691-.
- *Vincent, C., & Chappuis, J.* C. R. 103 (1886) 879-; J. de Ps. 5 (1886) 58-.
- of oxygen. *Wróblewski, Z.* [1883] (xii) Krk. Ak. (Mt.-Prz.) Rz. & Sp. 11 (1884) LIII-; (xi) C. R. 97 (1883) 809-.
- and volume, carbon disulphide and water. *Battelli, A.* Tor. Ac. Sc. Mm. 41 (1891) 25-.
- of water. *Straus, O. E.* (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) (Pt. 1) 510-.
- pressure of water vapour at. *Cailletet, L., & Colardeau, E.* C. R. 112 (1891) 1170-; Par. S. Ps. Sé. (1891) 172-.
- reappearance of liquid at. *Dwelschauvers-Dery, E. V.* Brux. Ac. Bll. 31 (1896) 277-.
- solutions of solids. *Pictet, R.* C. R. 120 (1895) 64-.
- and surface tension. *Eötös, L.* Mth. Termt. Éts. 3 (1885) 54-.
- thermal and calorific constants at. *Laar, J. J. van.* Z. Ps. C. 11 (1893) 721-.
- and thermal expansion of liquid, relations. *Bartoli, A., & Stracciati, E.* N. Cim. 16 (1884) 91-.
- — — — (Bartoli and Stracciati). *Thorpe, T. E., & Rücker, A. W.* L. Ps. S. P. 8 (1887) 84-; Ph. Mg. 21 (1886) 431-.

## Continuity of State 1880

- and thermal expansion of liquid, relations (Thorpe and Rücker). *Bartoli, A., & Stracciati, E.* Ph. Mg. 22 (1886) 533-.
- variability. *Heen, P. de.* Brux. Ac. Bll. 24 (1892) 96-.
- variation of temperature of transformation around. *Heen, P. de.* Brux. Ac. Bll. 25 (1893) 695-.
- Critical volume, determination. *Young, S. L.* Ps. S. P. 12 (1894) 137-; Ph. Mg. 34 (1892) 503-.
- — — *Laar, J. J. van.* Z. Ps. C. 11 (1893) 661-.
- Density of sulphur dioxide as liquid and as saturated vapour. *Cailletet, L., & Mathias, E.* C. R. 104 (1887) 1563-; Par. S. Ps. Sé. (1887) 162-.
- Determination of densities of liquefied gases and their saturated vapours. *Amagat, —.* C. R. 114 (1892) 1093-, 1322-; Par. S. Ps. Sé. (1892) 230-, 242-.
- Different states of matter. *Bogaevskij, L.* St. Pét. Ac. Sc. Mm. 5 (1897) No. 13, 104 pp.
- Fluid, limiting steam-liquid temperature. *Thomson, (Sir) W. B. A.* Rp. (1880) 496-.
- Gaseous and liquid states, properties. *Groshans, J. A.* [1864-78] Arch. Sc. Ps. Nt. 23 (1865) 73-; A. Ps. C. 6 (1879) 119-.
- state. *Andrews, T.* Phil. Trans. 166 (1876) 421-.
- Isometrics of liquid matter. *Barus, C.* Ph. Mg. 30 (1890) 338-.
- Isothermals for dissociated mixtures. *Ikeda, K.* Z. Ps. C. 33 (1900) 287-.
- , empirical and theoretical, of mixtures. *Blümcke, A.* Z. Ps. C. 6 (1890) 153-, 407-.
- — — —, variation with temperature. *Blümcke, A.* Z. Ps. C. 8 (1891) 554-; 9 (1892) 78-.
- Liquefied gases. *Dewar, J.* [1884] R. I. P. 11 (1887) 148-.
- Natterer's tubes, effects of mirage and differences of density. *Villard, P.* C. R. 121 (1895) 115-; Par. S. Ps. Sé. (1896) 73-.
- — —, phenomena. *Gouy, —.* C. R. 121 (1895) 201-.
- — —, properties. *Raveau, —.* Par. S. Ps. Sé. (1892) 213-.
- Physical and chemical phenomena at low temperatures. *Sluginov, N. P.* Kazan S. Ps.-Mth. Bll. 8 (1893) (Prot.) 23-.
- Ratio of heat of internal vaporisation to difference of densities. *Mathias, —.* Par. S. Ps. Sé. (1900) 34\*-.
- State of matter characterised by independence of pressure and specific volume. *Heen, P. de.* Brux. Ac. Bll. 24 (1892) 267-.
- Surface between liquid and vapour, influence of external pressure. *Schiller, N. N.* Rs. Ps.-C. S. J. 30 (Ps.) (1893) 79-.
- Thermal properties of ethyl oxide. *Ramsay, W., & Young, S.* [1886] Phil. Trans. (A) 173 (1888) 57-.
- — — methyl alcohol. *Ramsay, W., & Young, S.* [1887] Phil. Trans. (A) 173 (1888) 313-.

## 1885 Corresponding States Equilibrium in Coexistent Phases 1887

- Thermal properties of propyl alcohol. *Ramsay, W., & Young, S.* [1888-89] *Phil. Trans.* (A) 180 (1890) 137-.
- Transformation of state of bodies, new theory. *Moulin, H.* *Par. S. Ps. Sé.* (1896) 45-, 268-.
- Tubes of Cagniard de la Tour. *Biernacki, W.* *Wiad. Mt.* 2 (1898) 126-.
- Van der Waals's surface for mixtures, plait-points. *Kuener, J. P.* *Amst. Ak. Vs.* [2] (1894) 28-; *Arch. Néerl.* 1 (1898) 270-.

### 1885 Corresponding States.

- Meyer [nde Bjerrum], K.* [1899] *Kjøb. Dn. Vd. Selsk. Skr.* 9 (1898-1901) 155-; *Z. Ps. C.* 32 (1900) 1-.
- Coefficients of expansion and compression in corresponding states. *Waals, J. D. van der.* *Amst. Ak. Vh.* 20 (1880) (Nos. 6 & 7) 32+11 pp.; *A. Ps. C. Beibl.* 5 (1881) 27-, 250-.
- Corresponding pressures, diameter of densities at. *Mathias, E. J.* *de Ps.* 2 (1898) 224-.
- temperatures. *Groshans, J. A.* *Cosmos* 3 (1868) 285-, 310-.
- (Groshans's rule). *Bartoli, A., & Straciaciati, E.* *N. Cim.* 18 (1885) 193-.
- — *Dühring, U.* *A. Ps. C.* 52 (1894) 556-.
- — with equal vapour pressures. *Groshans, J. A.* *A. Ps. C.* 60 (1897) 169-; 61 (1897) 142-.
- Isothermal compressibility of liquids and gases, and corresponding states. *Brillouin, M. J.* *de Ps.* 2 (1893) 113-.

### LAW OF CORRESPONDING STATES.

- Waals, J. D. van der.* *Amst. Ak. Vh.* 21 (1881) (No. 5) 10 pp.; *A. Ps. C. Beibl.* 5 (1881) 567-.
- Bakker, G. Z.* *Ps. C.* 21 (1896) 127-, 507-.
- Waals, J. D. van der (jun.).* [1896] *Amst. Ak. Vs.* 5 (1897) 248-; *Fschr. Ps.* (1896) (Ab. 2) 200-.
- Moulin, —.* *Par. S. Ps. Sé.* (1899) 16\*-.  
*Berthelot, D.* *C. R.* 131 (1900) 175-.
- application to dissolved substances. *Waals, J. D. van der.* *Amst. Ak. Vs. M.* 9 (1892) 346-; *Fschr. Ps.* (1892) (Ab. 1) 377-.
- and characteristic equation of fluids. *Raveau, C.* *Par. S. Ps. Sé.* (1896) 274-.
- corresponding boiling points. *Dühring, U.* *A. Ps. C.* 11 (1880) 163-.
- — — (Dühring). *Winkelmann, A. A. A.* *Ps. C.* 11 (1880) 534-.
- — —, priority claim. *Dühring, U.* *C. R.* 91 (1880) 980-; *Z. Ps. C.* 13 (1894) 492-.
- and critical phenomena. *Zambiasi, G.* *Rm. R. Ac. Linc. Rd.* 3 (1894) (Sem. 2) 184-.
- law of rectilinear diameter. *Mathias, E.* *J. de Ps.* 8 (1899) 407-; *Liège S. Sc. Mm.* 2 (1900) No. 1, 28 pp.
- for mixtures of carbon dioxide and hydrogen. *Verschaffelt, J. E.* *Arch. Néerl.* 5 (1900) 644-.
- — liquids. *Kowalski, J.* *Par. S. Ps. Sé.* (1893) 259-.
- relations expressing. *Amagat, E. H.* *C. R.* 124 (1897) 547-.

- vapours not obeying. *Leduc, A.* *C. R.* 128 (1899) 1314-.
- of van der Waals. *Mathias, E.* *C. R.* 112 (1891) 85-, 404; *Toul. Fac. Sc. A.* 5 (1891) F, 24 pp.
- — — *Young, S.* [1892-93] *L. Ps. S. P.* 11 (1892) 233-; *Ph. Mg.* 33 (1892) 153-; *L. Ps. S. P.* 12 (1894) 447-; *Ph. Mg.* 37 (1894) 1-.
- — — *Amagat, E. H.* *C. R.* 123 (1896) 30-, 83-.
- — — *Raveau, C.* *C. R.* 123 (1896) 100-.

- Law of thermodynamic unity. *Kowalski, J.* *Par. S. Ps. Sé.* (1893) 261-.

### 1887 Equilibrium in Coexistent Phases. Phase Rule (General).

- Adiabatic changes of state of crystals in solid and liquid states. *Tammann, G.* [1899-1900] *Dorpat Sb.* 12 (1901) 270-; *A. Ps.* 1 (1900) 275-.
- — — — liquid and its saturated vapour. *Phillips, É.* *C. R.* 70 (1870) 548-.
- Coexistent phases, pressure. *Waals, J. D. van der.* *Arch. Néerl.* 26 (1893) 91-.
- —, vapour pressure. *Cantor, M. A.* *Ps. C.* 67 (1899) 683-.
- Equilibrium of 2 bodies, quadruple points. *Roozeboom, H. W. B.* *Rec. Tr. C. P.-Bas* 5 (1896) 393-.
- , chemical, in dilute solution and in gaseous state. *Hoff, J. H. van't.* [1886] *Stockh. Ak. Hndl.* 21 (1884-87) No. 17, 58 pp.
- of complex solid in presence of gas and liquid. *Waals, J. D. van der.* *Amst. Ak. Vs.* 5 (1897) 482-; *Arch. Néerl.* 1 (1898) 78-.
- crystalline and vapour phase. *Roozeboom, H. W. B.* *Arch. Néerl.* 5 (1900) 360-.
- — fluid and solid in contact, change of melting point by pressure. *Riecke, E. Gött. Nr.* (1894) 278-.
- — gaseous solutions and solid hydrates. *Waals, J. D. van der.* *Amst. Ak. Vs. M.* 1 (1885) 377-; *Rec. Tr. C. P.-Bas* 4 (1885) 135-.
- — — — — (van der Waals). *Roozeboom, H. W. B.* *Rec. Tr. C. P.-Bas* 5 (1886) 335-.
- — gases. *Marek, W. J.* *Carl Rpm.* 18 (1882) 544-.
- laws, identity in chemical, physical and mechanical phenomena. *Le Chatelier, H.* *Rv. Sc.* 40 (1887) 646-.
- and movement of mixed fluids. *Duhem, P.* *Lille Tr. Mm.* 3 (1893) *Mém.* 11, 186 pp.
- of saturated vapour and its liquid. *Schiller, N.* *Mosc. S. Sc. Bll.* 91 (No. 2) (1895) 7-; *Fschr. Mth.* (1895) 1048-.
- — solid and liquid compounds of water with salts. *Roozeboom, H. W. B.* *Arch. Néerl.* 23 (1889) 199-.
- — solids, liquids and vapours. *Waals, J. D. van der.* *Amst. Ak. Vs. M.* 7 (1890) 4.

Equilibrium in ternary systems with 2 liquid phases. *Schreinemakers, F.* Amst. Ak. Vs. 6 (1898) 65-; Arch. Néerl. 1 (1898) 411-; 2 (1899) 21-, 144-; 3 (1900) 1-, 273-.

Modifications in specific volume of saturated vapour and of liquid due to changes of temperature, relation. *Waals, J. D. van der.* Arch. Néerl. 5 (1900) 407-.

"Phase doctrine," application to iron and steel. *Roozboom, H. W. B.* I. & S. I. J. (1900) (No. 2) 311-.

— rule, demonstration. *Sauvel, P.* J. Ps. C. 3 (1899) 69-.

Stability of irreversible hydrosols. *Hardy, W. B.* R. S. P. 66 (1900) 110-.

Triple point, property. *Moutier, J.* Par. S. Phlm. Bll. 3 (1879) 233-.

— points of bromine and iodine. *Tsuruta, K.* Ps. Z. 1 (1900) 417-.

### 1890 HygroscoPy and Hygrometry.

(See also Meteorology 0270,  
1000-1060.)

Air, relations to heat, cold, and moisture. *Leslie, J.* Tilloch Ph. Mg. 41 (1813) 446-.

Aspirator, ether. *Dupont, M.* [1881] Par. S. Phlm. Bll. 6 (1882) 74-.

—, siphon. *Dupont, M.* [1881] Par. S. Phlm. Bll. 6 (1882) 21-.

Atmidometer. *Bellani, A.* Brugnattelli G. 9 (1816) 102-, 188-, 250-, 417-; 10 (1817) 348-, 422-; 3 (1820) 166-.

— *Reischauer, C.* [G.], & *Vogel, A.* Münch. Gelehrte Az. 42 (1856) (Bll.) No. 1, 15-.

Atmometer. *Anderson, A.* Edinb. Ph. J. 2 (1820) 64-.

"Chameleon" barometer, value as hygrometer. *Smith, A. P.* Nt. 11 (1875) 307, 365.

Condensation of vapour on cold surface. *Dalmahoy, J.* [1851] Edinb. R. S. T. 20 (1853) 299-.

— — — Rhône glacier. *Dufour, C.* As. Fr. C. R. 7 (1879) 285-.

Desiccator, mean temperature, calculation. *Grassi, G.* Nap. I. Inc. At. 6 (1887) No. 3, 15 pp.

Dew formation, observations. *Alvord, H. E.* Am. As. P. (1886) 113-.

Dew point found from cold produced by evaporation. *Meikle, H.* Edinb. N. Ph. J. 16 (1834) 98-; 18 (1835) 319-.

— observations, Pike's Peak, test of Regnault's formula and tables. *Abbe, C.* [U. S.] Chief Sig. Off. A. Rp. (\*1890) 852-.

— and psychrometer indications, relation. *Hazen, H. A.* [U. S.] Chief Sig. Off. A. Rp. (1890) 658-.

— psychrometric tables. *Marvin, C. F.* [U. S. Chief Sig. Off. A. Rp. (1891)] 351-.

Evaporation and precipitation in atmosphere. *Parrot, G. F.* Gilbert A. 10 (1802) 168-.

— — — (Parrot). *Böckmann, C. W.* Gilbert A. 11 (1802) 66-.

Evaporation and precipitation in atmosphere (Parrot). *Wrede, E. F.* Gilbert A. 12 (1803) 319-.

Humidity, determination. *Sohlberg, K. H.* Stockh. Öfv. (1890) 49-; Föchr. Ps. (1890) (Ab. 2) 345-.

—, — by psychrometer and hair-hygrometer. *Koppe, C.* Wien Met. Z. 13 (1879) 49-.

—, — spectroscopically. *Cory, F. W.* [1887] Met. S. QJ. 14 (1888) 85-.

—, — —. *Arendt, T.* Met. Z. 13 (1896) 376-.

—, — —. *Jewell, L. E.* Asps. J. 4 (1896) 324-.

— at high temperatures, calculation from observations of wet and dry bulb thermometers. *Strachan, R.* Nt. 35 (1887) 7.

— low temperatures. *Marvin, C. F.* [U. S.] Chief Sig. Off. A. Rp. (1890) 650-; (1891) 351-.

—, psychrometric method, and tables for direct deduction. *Hazen, H. A.* U. S. Weath. Bur. Rp. (1897-98) 327-.

—, relative. *Weihrauch, K.* Mosc. S. Nt. Bll. 59 (1884) 1-, 304-.

— of soil. *King, —.* A. Agn. 22 (1896) 161-.

Hydroscope of Sinesio. *Angelelli, M.* [1842] (vi Add.) N. A. Sc. Nt. 1 (1844) 5-.

Hydrosopic researches of Abbé Paramelle. *Maillet, —.* (viii) Reims Sé. Ac. 5 (1847) 265-.

Hygrometric calculations, slide rule for. *Welsh, J. B. A.* Rp. (1851) (pt. 2) 42-.

— method, new. *Delarive, A.* Bb. Un. 28 (1825) 285-.

—, —. *Emmerich, R.* [1891] Münch. Gs. Mph. Pl. Sb. 7 (1892) 143-.

— methods, experimental investigation. *Vogel, A.* Münch. Ab. 8 (1860) 295-.

— principles. *Idé, J. J. A.* Mosc. Cm. S. Pa. Md. 1 (1808) 105-.

— properties of insoluble compounds. *Griffiths, T.* QJ. Sc. 19 (1825) 92-.

— — wool. *Maumené, E. J.* (viii) Reims Sé. Ac. 11 (1850) 80-.

— state of air as affecting temperature of bodies. *Papasogli, —.* Arch. Phm. 224 (1886) 559.

— — —, determination. *Suerman, A. C. G.* Leijd. A. Ac. (1829-30) 123 pp.

— — —, diagrammatic representation. *Passaro, E.* Nap. I. Inc. At. 3 (1890) No. 5, 12 pp.

— tables, construction. *Pichot, A.* C. R. 46 (1858) 1052-.

— for dew-point and relative humidity. *Abbe, C.* [U. S.] Chief Sig. Off. A. Rp. (\*1881) 1138-.

— use of sulphuric acid. *Delarive, A.* Arch. Sc. Ps. Nt. 44 (1872) 79-.

### HYGROMETRY.

*Lüdicke, M. A. F.* Gilbert A. 1 (1799) 282-; 2 (1799) 70-; 5 (1800) 79-.

*Arnim, L. A. von.* Gilbert A. 4 (1800) 308-.

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- Aubuisson de Voisins, J. F. d'*. J. Mines 27 (1810) 411-.
- (Dalton's.) *Erman, P.* Gilbert A. 40 (1812) 389-.
- Melloni, M.* [1829] A. C. 43 (1830) 39-.
- Prinsep, J.* Gleanings Sc. 1 (1829) 45-, 189-.
- Kämtz, L. F.* Quetelet Cor. Mth. 10 (1838) 350-.
- Colson, J. H.* Brux. A. Un. (1843) 75-.
- Scherpenzeel-Thim, J. H. von.* Brux. A. Un. 2 (1843) 171-.
- Regnault, V.* C. R. 20 (1845) 1127-, 1220-.
- (Regnault.) *Majocchi, G. A.* (vi *Adds.*) *Majocchi A. Fis.* C. 22 (1846) 29-, 233-; 23 (1846) 33-, 274-.
- Lefebvre, G. A. C.* 25 (1849) 111-.
- Regnault, V.* C. R. 35 (1852) 930-; A. C. 87 (1853) 257-.
- Avé-Lallement, G. M. F.* (xii) *Arg. S. Ci. A.* 4 (1877) 252-.
- Crova, A.* [1883] *Mntp. Ac. Mm.* 10 (1884) 411-.
- Jamin, J.* C. R. 98 (1884) 1561-.
- application of cold of evaporation to. *August, E. F.* *Pogg. A.* 5 (1825) 69-, 335-.
- August's formula.* *Kupffer, A. T.* *St. Pét. Ac. Sc. Bll.* 6 (1840) 337-.
- and barometry. [*Shortrede non*] *Shortreed, R.* R. S. P. 5 (1845) 548-.
- experiments. *Leslie, J.* *Tilloch Ph. Mg.* 42 (1813) 44-.

## HYGROMETERS.

- Leslie, J.* *Nicholson J.* 3 (1800) 461-; A. C. 35 (1800) 8-.
- Voigt, F. W.* Gilbert A. 3 (1800) 126-.
- Berzelius, J. J.* *Hisinger Afh. Fys.* 2 (1807) 35-; *Tilloch Ph. Mg.* 33 (1809) 39-.
- Adie, Alex.* [1819] *Edinb. Mm. Wern. S.* 3 (1817-20) 483-.
- Livingstone, J.* *Edinb. Ph. J.* 1 (1819) 116-.
- Jones, T.* [1825] *Phil. Trans.* (1826) (pt. 2) 58-.
- (Jones.) *Daniell, J. F.* *QJ. Sc.* 21 (1826) 320-.
- Baumgartner, A. von.* *Baumgartner Z.* 5 (1829) 293-.
- Anon.* (vi 353) *Edinb. N. Ph. J.* 15 (1833) 273-; 17 (1834) 330-.
- Mason, J. A.* *Thomson Rc.* 4 (1836) 23-, 96-.
- Majocchi, G. A.* (vi *Adds.*) *Majocchi A. Fis.* C. 1 (1841) 30-.
- (modified thermometer.) *Nollet, F. J. C.* *Méd.* 8 (1842) 185-.
- Majocchi, G. A.* (vi *Adds.*) *Majocchi A. Fis.* C. 14 (1844) 57-, 143-.
- Belli, G.* A. C. 15 (1845) 506-.
- Majocchi, G. A.* A. C. 19 (1847) 77-.
- Batchelder, J. M.* *Franklin I. J.* 18 (1849) 444-.
- Whitehouse, W.* R. S. P. 20 (1872) 180-.
- Wolpert, A.* *Carl Rpm.* 9 (1873) 160-.
- Edelmann, M. T.* [1878] *A. Ps. C.* 6 (1879) 455-.
- Dines, G.* [1879] *Met. S. QJ.* 6 (1880) 39-.
- Stok, J. P. van der.* *Batavia Ntk. Ts.* 88 (1879) 200-.
- Hertz, H. R.* (xii) *Berl. Ps. Gs. Vh.* 1 (1882) 18-.

## Hygrometers 1890

- Bourbouze, —.* J. de Ps. 4 (1885) 425-.
- Tait, —.* *Edinb. R. S. P.* 13 (1886) 116-.
- Pizzarello, A.* [1888] *Moncalieri Oss. Bll.* 9 (1889) 181-.
- Agamennone, G., & Bonetti, F.* *Rm. R. Ac. Linc. Rd.* 1 (1892) (Sem. 2) 216-; 3 (1894) (Sem. 2) 28-.
- Anon.* *Cztg. Opt.* 16 (1895) 111-, 123-.
- Pettinelli, P.* *Rv. Sc. Ind.* 29 (1897) 93-.
- absorption-. *Hasselt, A. van.* (xii) *Mbl. Nt.* 9 (1879) 71-, 101-; *Forsch. Ag.-Ps.* 3 (1880) 204-.
- *Matern, A.* [1879-80] *A. Ps. C.* 9 (1880) 147-; 10 (1880) 149-.
- *Voller, C. A.* *Hamb. Nw. Vr. Vh.* 4 (1880) 100-.
- *Weber, R.* *Neuch. S. Sc. Bll.* 27 (1899) 54-.
- , calibration. *Crova, A.* [1883-84] *Mntp. Ac. Mm.* 10 (1884) 548-.
- , *Rüdorff's*, modification. *Neesen, F. A.* *Ps. C.* 11 (1880) 526-.
- Arundo phragmites.* *Adie, Alex.* *Edinb. Ph. J.* 1 (1819) 32-.
- balance-. *Snellen, M.* [with note by *Baumhauer, E. H. von.*] *Arch. Néerl.* 9 (1874) 477-.
- bifilar. *Klinkerfues, E. F. W.* *Dingler* 226 (1877) 100-.
- (of *Klinkerfues*). *Müttrich, A.* *Wien Met. Z.* 15 (1880) 170-.
- Daniell's.* *Brouwer, S.* *Hall Bij.* 6 (1831) 272-.
- , modification. *Pfeiffer, (Dr.) L.* *Z. Bl.* 9 (1873) 243-.
- dew-point. *Foggo, J.* *Edinb. J. Sc.* 4 (1826) 127; 7 (1827) 36-.
- *Sonklar, K. von.* *Wien SB.* 22 (1856) 271-.
- *Bourbouze, —.* C. R. 100 (1885) 1538-.
- *Sire, G.* [1885] C. R. 101 (1885) 638; *Arch. Sc. Ps. Nt.* 14 (1885) 220-; *Doubs S. Mm.* 10 (1886) 164-.
- *Dufour, H.* [1888-89] *Laus. S. Vd. Bll.* 24 (1889) 88-; *J. de Ps.* 8 (1889) 74-.
- *Gilbault, H.* C. R. 114 (1892) 67.
- , with tables. *Yvon, P.* *J. de Phm.* 28 (1878) 103-.
- , and wet bulb thermometer. *Espy, J. P.* *Franklin I. J.* 13 (1834) 81-.
- direct, modification. *Chistoni, C.* [1883] *Spet. It. Mm.* 12 (1884) 81-.
- Edelmann. Cancani, A.* *Rm. R. Ac. Linc. Rd.* 1 (1885) 475-.
- electric. *Blake, L. I.* *Kan. Ac. Sc. T.* 12 (1890) 67.
- empirical calibration. *Sire, G.* C. R. 101 (1885) 312.
- ether. *Adie, John.* *Edinb. J. Sc.* 1 (1829) 60-.
- by evaporation. *Ivory, J.* *Tilloch Ph. Mg.* 60 (1822) 81-.
- and evaporation. *Meikle, H.* *Edinb. N. Ph. J.* 2 (1827) 22-.
- expansion-. *Cozza, R.* *Arch. Sc. Ps. Nt.* 10 (1900) 132-.
- gelatin. *Nodon, A.* *Par. S. Ps. Sé.* (1886) 148-.

## 1890 Hygrometers

- hair-. *Babinet, J.* Edinb. J. Sc. 1 (1824) 309-; Pogg. A. 2 (1824) 77-.
- . *Pictet, M. A.* Bb. Un. 27 (1824) 120-.
- . *Prinsep, J.* QJ. Sc. 22 (1827) 28-.
- . *Hermann, F.* Sch. Nf. Gs. Vh. 53 (1869) 76-.
- . *Sire, G.* [1872] (xii) Doubs S. Mm. 7 (1873) 101-.
- . *Koppe, C.* Dingler 226 (1877) 297-.
- . *Meyn, R.* Carl Rpm. 14 (1878) 51-.
- . maximum and minimum, de Saussure's registering. *Landriani, M.* Brugnattelli G. 3 (1820) 110-.
- , ---, ---. *Char[r]ière, A., & Midre,* Lyon S. Ag. A. 4 (1860) 184-.
- , with spring. *Reinbot, P.* (xiii) Rs. Ps. C. S. J. 12 (Ps.) (1880) [(Pt. 1)] 248-, 247-.
- , use. *Troubridge, C. C.* Science 4 (1896) 62-.
- history. *Symons, G. J.* Met. S. QJ. 7 (1881) 161-.
- and hygrometric methods. *Tschaplowitz [Chaplovits], F.* Lndw. V.-St. 27 (1882) 65-.
- Leslie's. *Watson, H. H.* B. A. Rp. (1834) 569.
- and hair-. *Lüdicke, M. A. F.* Gilbert A. 10 (1902) 110-.
- , de Saussure's and de Luc's, comparison. *Böckmann, C. W.* Gilbert A. 15 (1903) 355-.
- Majocchi's. *Regnault, V.* A. C. 19 (1847) 82-.
- portable. *Hayes, A. A.* Silliman J. 17 (1830) 351-.
- registering. *Baumhauer, E. H. von.* Pogg. A. 93 (1854) 343-.
- . *Vivian, E.* (viii) Devon. As. T. (pt. 2) (1863) 50.
- . *Nodon, A.* C. R. 102 (1886) 1371-.
- , maximum and minimum. *Donovan, M.* Ir. Ac. P. 1 (1874) 476-, 556-; 2 (1877) 166-.
- Regnault's. *Donovan, M.* [1869] Ir. Ac. P. 10 (1870) 459-.
- de Saussure's. *Pictet, M. A.* Bb. Un. 27 (1824) 22-.
- , improvement. *Cagnazzi, L. de S.* Nap. At. Ac. 1 (1819) 43-.
- sensitive. *Kater, H.* As. Researches 9 (1807) 24-, 394-.
- . *Holtz, W.* N.-Vorp. Mt. 17 (1886) 63-.
- silk-. *Parrot, G. F.* (viii) Pander Btr. Ntk. 1 (1820) 75-.
- slow-acting. *Franklin, B.* Am. Ph. S. T. 2 (1786) 51-.
- vegetable. *Soares-Barbosa, A.* Lisb. Mm. Ac. Sc. 1 (1797) 262-.
- wet bulb. *Marriott, W.* [1876] Met. S. QJ. 3 (1877) 283-.
- , formula for dew-point. *Apjohn, Jas.* Ph. Mg. 6 (1835) 182-; 7 (1835) 266-, 470-; 9 (1836) 187-.
- , hygrometric scale. *P.*, ---. Gleanings Sc. 1 (1829) 77-.
- , portable form. *Passerini, N.* Firenze Ac. Georg. At. 22 (1899) 41-.
- , theory. *Apjohn, Jas.* [1834] Ir. Ac. T. 17 (1837) 275-, 283-.
- and dry bulb. *Kämtz, L. F.* Pisa Misc. Md. Chir. 2 (1843) 207-.
- , ---, ---. *Marriott, W.* [1874] Met. S. QJ. 2 (1875) 271-.

## Hygrometry 1890

- wet and dry bulb. *Miller, S. H.* [1876] Met. S. QJ. 3 (1877) 150-.
- , ---, ---, experimental investigation. *Macé de Lépinay, J.* J. de Ps. 10 (1881) 17-.
- , ---, ---, formula. *Apjohn, Jas.* B. A. Rp. (1843) (pt. 2) 36-.
- , ---, ---, psychrometric tables for. *Coffin, J. H.* [1856] Smiths. Misc. Col. 1 (1862) 20 pp.
- , ---, ---, reliability. *Hazen, H. A.* Science 1 (\*1883) 502-.
- Hygroscope. *Benout, ---.* QJ. Sc. 1 (1830) 195-.
- , fir branch. *Doümet, N.* Par. Bll. S. Bt. 13 (1866) xliv-.
- , metal spiral. *Mithoff, O.* Cztg. Opt. 5 (1884) 137-.
- Hygroscopic motions of plants (anisotropy). *Verschaffelt, J.* [1891] Mbl. Nt. (1891-92) 13-.
- properties of Canadian fossil fuels. *Hoffmann, G. C.* [1889] Cn. R. S. P. & T. 7 (1890) (Sect. 3) 41-.
- , ---, cat-gut and hempen cord. *Corti, B.* Mod. Mm. S. It. 11 (1904) 642-.
- , ---, mica. *Riess, P.* Pogg. A. 67 (1846) 354-.
- , ---, textile fabrics. *Schlasing, T.* (fls). C. R. 116 (1893) 908-.
- , ---, tissues. *Quekett, E. J.* [1840] Mcr. S. T. 1 (1844) 23-.
- Moist bulb problem. [*Shortrede non*] *Shortreed, R.* R. S. P. 5 (1848) 740-.
- Psychrometer, aspiration-. *Assmann, R.* Z. Instk. 12 (1892) 1-.
- , ---. *Ellinger, H. O. G.* N. Ts. Fs. K. 2 (1897) 53-.
- , dry and wet bulb, and an improved chemical hygrometer. *Pembrey, M. S.* Ph. Mg. 35 (1893) 525-.
- , Loew's. *Scheurer, A., & Wild, E.* Mulhouse S. In. Bll. 63 (1898) 266-.
- , portable. *Passerini, N.* Rv. Sc.-Ind. 32 (1900) 43-.
- Psychrometers, theory. *Pernter, J. M.* [1883] Exner Rpm. 20 (\*1884) 154-.
- Psychrometric tables and formula (vapour tension, dew-point and relative humidity), for whirled psychrometer. *Ferrel, W.* [U. S.] Chief Sig. Off. A. Rp. (1886) 233-.
- Saturation deficit. *Weihrauch, K.* Met. Z. 2 (1885) 260-.
- , ---. *Meyer, H.* Met. Z. 4 (1887) 113-, [56].
- Temperature of vapour, Dalton's law. *Buquoy, G. von.* Oken Isis (1824) 751-.
- Vapour in atmosphere, determination. *Ekelund, A. W.* Sk. Nf. F. 1 (1839) 119-.
- , pressure in arable land. *Hervé-Mangon, C. F.* Cosmos 6 (1870) 75-.
- , ---, atmosphere. *Apjohn, Jas., & Lloyd, H.* Ir. Ac. P. 1 (1841) 433-.
- , ---, ---. *Renoux, P.* C. R. 47 (1858) 354-.
- , ---, ---, Dalton's theory. *Lamont, J.* Ph. Mg. 24 (1862) 350-.

## 1900 Sublimation

- Vapour pressure in atmosphere, maximum. *Pierre, V.* Wien SB. (1849) 267-, (Ab. 2) 30-.
- , method of measuring. *Pierre, V.* Wien SB. (1850) (Ab. 2) 63-.
- pressures, Regnault's, tests, and extension to lower temperatures. *Hazen, H. A.* [U. S.] Chief Sig. Off. A. Rp. (1890) 658-.
- , —, —, —, —, —. *Marvin, C. F.* [U. S. Chief Sig. Off. A. Rp. (1891)] 351-.

## 1900 Vaporisation of Solids. Sublimation.

- Camphor, motion towards light. *Tomlinson, C.* Ph. Mg. 24 (1862) 358-.
- , —, —, —. *Draper, J. W.* Ph. Mg. 25 (1863) 342-.
- Carbon dioxide snow, thermometric and cryogenic application. *Du Bois, H., & Wills, A. P.* D. Ps. Gs. Vh. (1899) 168-.
- Solids and vapours. *Bancroft, W. D.* Ps. Rv. 3 (1896) 401-.
- Vaporisation of fire-proof substances. *Hermstadt, S. F.* Berl. Ab. (1814-15) (Ps.) 63-.
- ice. *Schübler, G.* Würtb. Ab. 1 (1826) 211-.
- — and snow. *Carradori, G.* Brugnatelli G. 5 (1812) 208-.
- iron at ordinary temperature. *Pellat, H.* C. R. 126 (1898) 1838.
- , limits. *Faraday, M.* Phil. Trans. (1826) 484-; R. I. P. 1 (1831) 70-.
- of metals by electricity. *Hopkins, (Rev.) G. H.* Nt. 10 (1874) 190-.
- — at ordinary temperature. *Pellat, H.* C. R. 123 (1896) 104-.
- solids. *Baumgartner, G.* Carl Rpm. 13 (1877) 525-.
- Vapour pressure of solids and liquids, transition between. *Ramsay, W., & Young, S.* L. Ps. S. P. 8 (1887) 119-; Ph. Mg. 23 (1887) 61-, 138.
- Volatilisation of solids, influence of pressure. *Ramsay, W., & Young, S.* [1893] Phil. Trans. 175 (1895) 37-.
- Water vapour, sudden change to ice. *Bugge, —.* (vi Add.) N. Al. J. C. 2 (1804) 701-.

## 1920 Solutions and Liquid Mixtures: Melting-Point, Boiling-Point, Vapour Pressure, etc.

- Acetic acid and water, distillation. *Aignan, —, & Chabot, P.* [1893] Bordeaux S. Sc. Mm. 4 (1894) xv-.
- Alcohol and carbon dioxide mixtures, density. *Bliumcke, A.* A. Ps. C. 30 (1887) 243-.
- Alloys, eutectic, constitution. *Charpy, G.* Par. S. Ps. Sé. (1897) 87-.
- , fusibility. *Le Chatelier, —.* Par. S. Ps. Sé. (1894) 266.
- American petroleum and Russian kerosene, fractional distillation. *Wanklyn, J. A., & Cooper, W. J.* Ph. Mg. 40 (1895) 225-.
- Aqueous solutions, temperature of vapour from. *Zantedeschi, F.* Aten. It. 3 (1854) 14-.

## Solutions and Liquid Mixtures 1920

- Boiling of mixtures of 2 liquids, and "bumping" of such mixtures. *Magnus, G.* Pogg. A. 38 (1836) 431-.
- point curves. *Speyers, C. L.* Am. J. Sc. 9 (1900) 341-.
- of solutions, measurement. *Raoult, F. M.* Isère S. Bll. 27 (1892) 633-.
- salt solutions, temperature of vapour from. *Rudberg, F.* Lieb. A. 16 (1835) 143-.
- , —, —, —, —. *Wüllner, A.* Pogg. A. 110 (1860) 387-.
- , —, —, —, —. *Gill, J.* Ph. Mg. 32 (1866) 481-.
- , —, —, —, —. *Müller, F. C. G.* Berl. B. 9 (1876) 1629-.
- , —, —, —, —. *Wüllner, F. H. A. A.* Berl. B. 10 (1877) 256-.
- , —, —, —, —. *Pfaundler, L.* Berl. B. 10 (1877) 463-.
- , —, —, —, —. *Müller, F. C. G.* Berl. B. 10 (1877) 1327-.
- , —, —, —, —. *Kahlbaum, G. W. A.* Basel Vh. 8 (1890) 418-.
- , —, —, —, —. *Sakurai, J.* [1898] Tök. Coll. Sc. J. 6 (1894) 1-.
- , —, —, —, —, and from mixed liquids. *Magnus, G.* Berl. Mb. (1861) 157-.
- Bubble formation in frozen liquids. *Karsten, G.* [1898] Schl.-Holst. Nt. Vr. Schr. 10 (1895) 309-.
- Carbon disulphide and carbon tetrachloride, distillation of mixtures. *Brown, F. D. C.* S. J. 39 (1881) 304-.
- Change of volume due to solution of salts in water. *Heritsch, A.* A. Ps. C. 36 (1899) 115-.
- Constitution of cryohydrates. *Ponsot, A.* Par. S. Ps. Sé. (1894) 278-.
- Corresponding states of salt solutions. *Bender, C.* A. Ps. C. 22 (1884) 179-; 31 (1887) 872-.
- Eutectic mixtures. *Guthrie, Fred.* L. Ps. S. P. 6 (1885) 124-; Ph. Mg. 17 (1884) 462-.
- Evaporation of solutions. *Laval, E.* Bordeaux S. Sc. Mm. 2 (1896) 37-.
- —, saline. *Pfaundler, L.* D. Nf. Tbl. (\*1875) 208.
- , —, —. *Moutier, J.* Par. S. Phlm. Bll. 5 (1881) 146-.
- , —, —. *Marguerite-Delacharlonny, P.* As. Fr. C. R. (1887) (Pt. 1) 198.
- , —, —, and water. *Lesage, P.* As. Fr. C. R. (1892) (Pt. 2) 238-; C. R. 115 (1892) 478.

## FREEZING POINT OF SOLUTIONS AND LIQUID MIXTURES.

- Rüdorff, F.* Pogg. A. 114 (1861) 63-; 116 (1862) 55-.
- Guldberg, C. M.* C. R. 70 (1870) 1849-.
- Raoult, F. M.* C. R. 98 (1884) 1047-; J. de Ps. 3 (1884) 16-; 5 (1886) 64-; Rv. Sc. 37 (1886) 673-.
- Ponsot, A.* Par. S. C. Bll. 17 (1897) 578.
- Apparatus, use for molecular weight determination. *Nernst, W.* Z. Ps. C. 6 (1890) 573-.



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- Binary mixtures. *Dahms, A.* [1894] A. Ps. C. 54 (1895) 486-; 60 (1897) 119-.
- Colloidal solutions. *Liubavin, N. N.* Rs. Ps.-C. S. J. 21 (C.) (1889) 397-; C. S. J. 58 (1890) (Abs.) 685-.
- Depression by dissolved gases. *Prytz, K. J.* de Ps. 2 (1893) 353-; 3 (1894) 584.
- Determination.*
- Bijlert, A. van.* Z. Ps. C. 8 (1891) 343-.
- Loomis, E. H.* A. Ps. C. 51 (1894) 500-.
- (*Loomis.*) *Kohlrausch, F.* A. Ps. C. 51 (1894) 524-.
- Jones, H. C.* A. Ps. C. 53 (1894) 392-.
- Ponsot, A.* C. R. 118 (1894) 977-.
- Loomis, E. H.* A. Ps. C. 57 (1896) 521-.
- Raoult, F. M.* C. R. 124 (1897) 851-.
- Ponsot, A.* C. R. 124 (1897) 1227-; Par. S. C. Bll. 17 (1897) 741-; Par. S. Ps. Sé. (1897) 26-.
- (*Raoult.*) *Battelli, A., & Stefanini, A. N.* Cim. 9 (1899) 5-.
- (—) *Ponsot, A.* Par. S. C. Bll. 21 (1899) 356-.
- (*Ponsot.*) *Raoult, —.* Par. S. C. Bll. 21 (1899) 610-.
- Ponsot, A.* Par. S. C. Bll. 21 (1899) 764-.
- (source of error.) *Raoult, F. M.* Isère S. Bll. 30 (1899) 19-.
- (precision cryoscopy.) *Raoult, F. M.* Isère S. Bll. 30 (1899) 337-.
- Chruššov, P.* C. R. 131 (1900) 883-.
- apparatus. *Raoult, —.* Isère S. Bll. 25 (1897) 363.
- of dilute solutions. *Arrhenius, S.* Stockh. Ak. Hndl. Bh. 14 (Afd. 1) (1889) No. 9, 23 pp.
- — — *Leduc, A.* C. R. 120 (1895) 436-; Par. S. Ps. Sé. (1895) 86-.
- exceptions to Raoult's law. *Hoff, J. H. van't.* Par. S. C. Bll. 5 (1891) 932.
- influence of temperature of freezing mixture. *Raoult, F. M.* C. R. 122 (1896) 1315-.
- platinum thermometer method. *Chruššov, P., & Sitnikov, A.* Fachr. Ps. (1898) (Ab. 2) 290.
- progress. *Raoult, F. M.* Isère S. Bll. 25 (1887) 245-.
- test of ionisation coefficients of solutions of sodium and potassium sulphates. *Archibald, E. H.* [1899] N. Scotia I. Sc. P. & T. 10 (1903) 33-.
- and theory of solutions. *Abegg, R.* A. Ps. C. 64 (1898) 486-.
- — — (*Abegg.*) *Dieterici, C.* A. Ps. C. 64 (1898) 809-.
- use for determining constitution. *Bilz, W.* N.-Vorp. Mt. 31 (1900) xv-.
- Dilute solutions. *Loomis, E. H.* Ps. Rv. 1 (1894) 199-, 274-, 381; 3 (1896) 270-, 293-.
- — — *Nernst, W., & Abegg, R.* Ph. Mg. 41 (1896) 196-.
- — — *Ponsot, —.* J. de Ps. 5 (1896) 337-; A. C. 10 (1897) 79-.
- — — *Loomis, E. H.* Ps. Rv. 4 (1897) 273-.
- — —, and vapour pressure. *Ponsot, A.* C. R. 120 (1895) 434-, 520.
- Electrolytes. *MacGregor, J. G.* Cn. R. S. P. & T. 6 (1900) (Sect. 3) 3-.
- , diagram of depressions. *MacGregor, J. G.* [1900] N. Scotia I. Sc. P. & T. 10 (1903) 211-.
- , mixtures. *Barnes, J.* [1900] N. Scotia I. Sc. P. & T. 10 (1903) 139-.
- Molecular depression. *Ponsot, A.* C. R. 122 (1896) 668-.
- — — by chlorides in solution. *Engel, —.* Par. S. Ps. Sé. (1898) 245-.
- weight determination by lowering freezing point. *Raoult, —.* Rv. Sc. 2 (1894) 321-.
- Non-electrolytes. *Loomis, E. H.* Ps. Rv. 9 (1899) 257-.
- Non-metallic mixtures. *Palazzo, L., & Battelli, A.* Tor. Ac. Sc. At. 19 (\*1883) 674-.
- Specified Substances.*
- acid solvents. *Raoult, F. M.* C. R. 96 (1883) 1653-.
- alcoholic liquors. *Raoult, F. M.* C. R. 90 (1890) 865-.
- alkaline solvents. *Raoult, F. M.* C. R. 97 (1883) 941-.
- benzene, molecular depression by alcohols. *Paternò, E.* Berl. B. 22 (1889) 1430-.
- , — — — iodoform. *Paternò, E.* Berl. B. 22 (1889) 465-.
- brines. *Buchanan, J. Y.* Edinb. R. S. P. 14 (1888) 129-.
- cane-sugar solutions and ethyl alcohol, cryoscopic relations. *Jones, H. C.* Ph. Mg. 40 (1895) 383-.
- formic acid mixtures with water. *Novák, V.* Ph. Mg. 44 (1897) 9-.
- gaseous solutions. *Barthélemy, A.* C. R. 70 (1870) 146-.
- hydrochloric and sulphuric acids, solutions. *Barnes, J.* Cn. R. S. P. & T. 6 (1900) (Sect. 3) 37-.
- mixtures of alcohol and water. *Pictet, R.* C. R. 119 (1894) 678-.
- , alcoholic, and their maximum density. *Rossetti, F.* Ven. At. 15 (1869-70) 1297-.
- sea water. *Ashe, W. A.* Science 9 (1887) 592.
- —, and melting point of sea water ice. *Ashe, W. A.* Science 10 (1887) 36.
- silver copper alloys (curves). *Heycock, C. T., & Neville, F. H.* Phil. Trans. (A) 189 (1897) 25-.
- sodium chloride solutions. *Pickering, S. U.* Ph. Mg. 37 (1894) 162-.
- — — *Ponsot, A.* C. R. 120 (1895) 317-.
- — —, determination of freezing point. *Ponsot, A.* C. R. 123 (1896) 189-.
- — — — — *Raoult, F. M.* C. R. 123 (1896) 475-, 631-.
- — — — — (*Raoult.*) *Ponsot, A.* C. R. 123 (1896) 557-.
- sulphuric acid, dilute. *Hillmayr, W.* Wien Ak. Sb. 106 (1897) (Ab. 2a) 5-; Mh. C. 18 (1897) 27-.
- — of various strengths. *Pictet, R.* C. R. 119 (1894) 642-.
- tin alloys. *Heycock, C. T., & Neville, F. H.* Camb. Ph. S. P. 6 (1889) 366-.

## 1920 Solutions and Mixtures

- water, oily and otherwise. *Dufour, H.* Laus. S. Vd. Bll. 35 (1899) xxiii-.
- wine and dilute alcohol. *Boussingault, J. B.* Erdm. J. Pr. C. 47 (1849) 181-.
- Freezing of aqueous solutions. *Dufour, L.* Laus. Bll. S. Vd. 6 (1860) 474-.
- solutions at constant temperature. *Colson, A.* C. R. 120 (1895) 991-.
- Isothermals of carbon dioxide and sulphur dioxide mixtures. *Blümcke, A.* A. Ps. C. 36 (1889) 911-.
- Lard and rosin mixture, melting point. *Olmsted, D.* Am. As. P. (1850) 33-.
- Liquid mixtures, composition of vapour. *Winkelmann, A.* A. Ps. C. 39 (1890) 1-.
- , properties. *Lehfeldt, R. A.* [1898] L. Ps. S. P. 16 (1899) 83-, 289-; Ph. Mg. 46 (1898) 42-; 47 (1899) 284-.
- Liquids, temperature variation on mixing. *Bussy, A. A. B., & Buignet, H.* C. R. 59 (1864) 673-, 785-.
- , —, — (Bussy and Buignet). *Favre, P.* A. C. R. 59 (1864) 783-.
- , —, —. *Jamin, J.* C. R. 70 (1870) 1309-; 71 (1870) 23-.
- , —, —, also contraction. *Klebnikof, P.* St. Pét. Ac. Sc. Bll. 6 (1863) 445-.
- Micromanometer, investigations with. *Smits, A.* Amst. Ak. Vs. 5 (1897) 292-; Arch. Néerl. 1 (1898) 97-.
- Mixtures, thermal study. *Favre, P. A. C.* R. 73 (1871) 717-.
- , thermochemistry. *Favre, P. A.* (vii) Marseille Mm. S. Ém. 1 (1861) 117-.
- Molecular equilibrium in mixed liquids. *Duclaux, E.* J. de Ps. 5 (1876) 18-.
- Mutual solubility of salts. *Le Chatelier, H.* Par. S. Ps. Sé. (1894) 268-.
- Orthobaric curves for homogeneous fluids, concordance. *Natanson, W.* Krk. Ak. (Mt.-Prz.) Rz. 3 (1891) 390-; Ph. Mg. 33 (1892) 152-.
- Osmotic equilibrium. *Ponsot, —.* Par. S. Ps. Sé. (1895) 121-.
- pressure and freezing point. *Arrhenius, S.* A. Ps. C. 51 (1894) 493-.
- — — and electric conductivity. *Reicher, L. T.* Mbl. Nt. (1888) 108-.
- — — of solutions. *Dieterici, C. A.* Ps. C. 52 (1894) 263-.
- Partial and osmotic pressure of mixture of volatile liquids. *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 1) 242-.
- Raoult's law of lowering of vapour pressure, theoretical explanation. *Donnan, F. G.* Ph. Mg. 34 (1892) 411-.
- Salt solutions and attached water. *Guthrie, Fred.* L. Ps. S. P. 6 (1885) 169-; Ph. Mg. 18 (1884) 22-, 105-.
- raised to boiling point by steam at 100°. *Spence, P.* B. A. Rp. 39 (1869) (Sect.) 75-.
- — — — —. *Müller, F. C. G.* Berl. B. 9 (1876) 1629-.
- — — — —. *Wüllner, F.* H. A. A. Berl. B. 10 (1877) 256-.
- — — — —. *Buchanan, J.* Y. [1898] So. Met. S. J. 11 (1900) 42-.

## Vapour Pressure of Mixtures 1920

- Solution of solids, rate. *Carbonelli, C. E.* Genova S. Lig. At. 3 (1892) 265-.
- Solvent, rapid evaporation, particles of dissolved substance carried into atmosphere by. *Marguerite-Delacharlony, P.* C. R. 103 (1886) 1128-.
- Steam and brines, boiling mixtures. *Buchanan, J. Y.* [1898] Edinb. R. S. T. 39 (1900) 529-.

### VAPOUR PRESSURE OF LIQUID MIXTURES.

- Wüllner, A.* A. Ps. C. 129 (1866) 353-.
- Konovalov, D. P.* [1881-83] A. Ps. C. 14 (1881) 34-, 219-; (xii) Rs. Ps.-C. S. J. 16 (Pt. 1) (1884) 11-.
- Jönsson, P.* Lund. Un. Acta 24 (1887-88) (Mth.) No. ii, 16 pp.; 25 (1888-89) (Mth.) No. ii, 18 pp.; Fachr. Ps. (1887) (Ab. 2) 373-; (1888) (Ab. 2) 341.
- Müller-Erzbach, W.* Exner Rpm. 24 (1888) 575-.
- Kahlbaum, G. W. A.* Basel Vh. 9 (1893) 573-.
- Müller, W. L., & Rosebrugh, T. R.* [1897] Cn. I. P. 1 (1898) 87-.
- Dolezalek, F.* Z. Ps. C. 26 (1898) 321-.
- Binary mixtures. *Magnus, G.* Pogg. A. 93 (1854) 579-.
- — —. *Duclaux, E.* A. C. 14 (1878) 305-; C. R. 86 (1878) 592-.
- — —. *Taylor, A. E.* J. Ps. C. 4 (1900) 290-, 355-, 675-.
- — —. *Zawidzki, J. von.* Z. Ps. C. 35 (1900) 129-.
- and ternary mixtures. *Schreinemakers, F. A. H.* Z. Ps. C. 35 (1900) 459-; Amst. Ak. Vs. 8 (1900) 704-; Amst. Ak. P. 3 (1901) 1-.
- Carbon dioxide and sulphur dioxide. *Blümcke, A.* A. Ps. C. 34 (1888) 10-.
- — — — — (Blümcke). *Pictet, R.* A. Ps. C. 34 (1888) 734-.
- Maximum pressures. *Isambert, —.* C. R. 98 (1884) 1327-.
- Mutually soluble mixtures. *Ostwald, W.* A. Ps. C. 63 (1897) 336-.
- Ternary mixtures. *Ostwald, W.* Leip. Mth. Ps. Ab. 25 (1899) 411-.
- — —. *Schreinemakers, F. A. H.* Arch. Néerl. 5 (1900) 214-.
- Volatile liquids. *Linebarger, C. E.* Am. C. S. J. 17 (1895) 615-, 690-.
- Water, ice and freezing saline solution, relation between vapour pressures. *Ponsot, A. C.* R. 119 (1894) 731-.
- and sulphuric acid. *Kirchhoff, G.* Pogg. A. 104 (1858) 612-.
- — — — — (Kirchhoff). *Wüllner, A.* Pogg. A. 105 (1858) 478-.

### VAPOUR PRESSURE OF SOLUTIONS.

- Babo, C. H. L. von.* [1853-57] Freiburg B. 1 (1858) 18-, 277-.
- Wüllner, A.* Pogg. A. 103 (1858) 529-; 105 (1858) 85-.
- (Wüllner.) *Kirchhoff, G.* Pogg. A. 106 (1859) 322-.
- (Kirchhoff.) *Wüllner, A.* Pogg. A. 106 (1859) 632-.

## 1920 Vapour Pressure of Solutions

- Pauchon, E. C. R. 89 (1879) 752-.
- Tammann, G. A. Ps. C. 24 (1885) 523-.
- Emden, R. A. Ps. C. 81 (1887) 145-.
- Tammann, G. St. Pét. Ac. Sc. Mm. 35 (1887) No. 9, 172 pp.; A. Ps. C. 86 (1889) 692-.
- (Tammann.) Emden, R. A. Ps. C. 38 (1889) 447-.
- Müller-Erbach, W. Z. Ps. C. 4 (1889) 1-.
- Ostwald, W. Humb. 8 (1889) 1-.
- Raoult, F. M. J. de Ps. 8 (1889) 5-.
- Charpy, G. C. R. 111 (1890) 102-.
- Ewan, T., & Ormandy, W. R. C. S. J. 61 (1892) 769-.
- Dieterici, C. A. Ps. C. 50 (1893) 47-.
- Marchis, L. J. de Ps. 3 (1894) 193-, 257-.
- (tonometry.) Raoult, F. M. [1895] Isère S. Bll. 29 (1897) 139-.
- Wade, E. B. H. R. S. P. 62 (1898) 376-.
- Dieterici, C. A. Ps. C. 67 (1899) 859-.
- alcoholic. Kablukov, I. Ra. Ps.-C. S. J. 23 (C.) (1891) 388-; C. S. J. 64 (1893) (Abs., Pt. 2) 154-.
- dilute. Dieterici, C. A. Ps. C. 62 (1897) 616-.
- Smits, A. Amst. Ak. Vs. 8 (1900) 714-; Amst. Ak. P. 2 (1900) 635-.
- etheral. Raoult, F. M. As. Fr. C. R. (1888) (Pt. 2) 206-.
- ethyl ether. Jacobsen, I. P. N. Ts. Fs. K. 3 (1898) 288-; Fschr. Ps. (1898) (Ab. 2) 316.
- formic acid. Raoult, F. M. C. R. 122 (1896) 1175-.
- and freezing point, relation between. Koldček, F. [1881] A. Ps. C. 15 (1882) 38-.
- hydrates transparent on losing water. Tammann, G. A. Ps. C. 68 (1897) 16-.
- hydrocarbons and mixtures of benzene and toluene. Mangold, C. Wien Ak. Sb. 102 (1893) (Ab. 2a) 1071-.
- lowering, effect on molecular state of solvent. Waals, J. D. van der. Amst. Ak. Vs. 5 (1897) 342-; Fschr. Ps. (1897) (Ab. 2) 313-.
- mathematical theory. Ponsot, A. C. R. 123 (1896) 648-.
- maximum, and temperature. Julius, V. A. Amst. Ak. Vs. 5 (1897) 295-; Arch. Néerl. 1 (1898) 393-.
- and osmotic pressure. Raoult, F. M. C. R. 105 (1887) 857-.
- potassium hydrate solutions, table. Errera, G. Gz. C. It. 18 (1888) 225-.
- salt hydrates. Wullner, A. Pogg. A. 110 (1860) 564-.
- , dissociating. Müller-Erbach, W. A. Ps. C. 23 (1884) 607-; 27 (1886) 623-; Wien Ak. Sb. 107 (1898) (Ab. 2a) 14-.
- sulphur. Combes, —. As. Fr. C. R. (1895) (Pt. 1) 237-.
- and phosphorus, in carbon disulphide. Guglielmo, G. Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 2) 210-.
- sulphuric acid. Tate, T. (viii) Ph. Mg. 26 (1863) 502-.
- volatile substances. Lehfeldt, R. A. L. Ps. S. P. 16 (1899) 490-; Ph. Mg. 48 (1899) 215-.
- water in its compounds, also volume. Müller-Erbach, W. Exner Rpm. 23 (1887) 510-.
- from salt solutions. Nicol, W. W. J. Ph. Mg. 22 (1886) 502-.

## Dissociation, etc. 1930

### 1925 Solutions: Other Thermal Properties (Latent Heat). (See 1690.)

- Colloids, heat evolved in swelling and solution. Wiedemann, E., & Lüdeking, C. A. Ps. C. 25 (1885) 145-.
- Heat of dilution and specific heat of salt solutions. Arons, L. A. Ps. C. 25 (1885) 408-.
- Heats of solution, determination. Neumayr, E. [1877] Innsb. Nt. Md. B. 8 (1879) (Heft 1) 12-.
- — — and of mixtures. Tumlirz, O. Wien Ak. Sb. 104 (1895) (Ab. 2a) 245-.
- — — osmotic pressure, theory. Dieterici, C. A. Ps. C. 45 (1892) 207-, 589-.
- — — of salts. Scholtz, R. A. Ps. C. 45 (1892) 193-.
- — — —. Tumlirz, O. Wien Ak. Sb. 102 (1893) (Ab. 2a) 888-.
- — — —, influence of temperature. Tilden, W. A. R. S. P. 38 (1885) 401-.
- Molecular heat. Wiedemann, E. E. G. A. Ps. C. 18 (1883) 608-.
- Salt solutions, formulæ. Duhem, P. C. R. 104 (1887) 683-; Par. Éc. Norm. A. 4 (1887) 381-.
- — —, thermal properties. Favre, P. A. C. R. 77 (1873) 101-.
- — — —. Illingworth, B., & Howard, A. L. Ps. S. P. 6 (1885) 212-; Ph. Mg. 18 (1884) 123-.
- — — —. Saporta, A. de. As. Fr. C. R. (1897) (Pt. 2) 252-.
- — — —. Monnet, E. Bordeaux S. So. Mm. 3 (1899) 41-.
- Specific heat. Puschl, K. Wien Ak. Sb. 109 (1900) (Ab. 2a) 981-; Mh. C. (1901) 77-.
- — — of solutions, and thermal effects at formation. Alekseyev, V. T. [1883] (xii) Ra. Ps.-C. S. J. 16 (Pt. 1) (1884) 109-; Berl. B. 17 (1884) (Ref.) 193-.
- Theory. Kazankin, N. P. Kazan S. Ps.-Mth. Bll. 2 (1893) (Prot.) 13-.

### 1930 Dissociation. Allotropic Transformations.

- Gases, dissociated (ions), chemical action and relation to condensation. Richarz, —. Bonn Niedr. Gs. Sb. (1889) 51-.
- , dissociation. Threlfall, R. N. S. W. R. S. J. 20 (1887) 213-.
- , —. Jäger, G. Wien Ak. Sb. 100 (1891) (Ab. 2a) 1182-; 104 (1895) (Ab. 2a) 671-.
- , perfect, dissociation in mixture. Duhem, P. Lille Tr. Mm. 2 (1891-92) Mem. 8, 215 pp.
- Hydrates, dissociation tension. Andreae, J. L. Rot. N. Vh. 3 (1890) (St. 3) No. 2, 45 pp.
- of inorganic salts, dissociation. Frowein, P. C. F. Z. Ps. C. 1 (1887) 5-.
- Silver iodide, dimorphism. Mallard, E., & Le Chatelier, —. Par. S. Ps. Sé. (1885) 18-.

## 1940 Superfusion

### 1940 Retardation Phenomena (Superfusion, Superheating, Supersaturation).

- "Fireless" steam-engine with soda boiler. *Bauer, A.* Oestr. Z. Brgw. 33 (1885) 81-, 51-, 73-, 108-, 141-, 152-, 174-, 181-, 206-, 219-, 232-, 249-, 265-.
- Retardation of boiling and of congelation of liquids. *Artur, J. F.* C. R. 57 (1868) 92-.

#### SUPERFUSION.

- Desains, E.* L'I. 25 (1857) 257-; C. R. 54 (1862) 371-; A. C. 64 (1862) 419-.
- Gernez, D.* C. R. 63 (1866) 217-.
- Moutier, J.* Par. S. Phlm. Bll. 13 (1876) 5-.
- Tumltz, O.* Wien Ak. Sb. 100 (1891) (Ab. 2a) 1197-; 103 (1894) (Ab. 2a) 266-.
- Bachmetjev, P.* Rs. Ps.-C. S. J. 32 (Ps.) (1900) 218-; Fschr. Ps. (1900) (Ab. 2) 261-.
- Silver thaw. *Groves, T. B.* Met. S. QJ. 15 (1899) 253.
- Superfused substances, solidification. *Moreschini, R.* Rm. B. Ac. Linc. Rd. 9 (1900) (Sem. 1) 13-.
- , —, rate. *Gernez, D.* Par. Éc. Norm. A. 1 (1884) 239-.
- , —, —. *Tammann, G.* Rs. Ps.-C. S. J. 29 (C.) (1897) 425-; Z. Ps. C. 23 (1897) 326-.
- , —, —. *Wilson, H. A.* [1898] Camb. Ph. S. P. 10 (1900) 25-.
- , —, —, and viscosity. *Wilson, H. A.* Ph. Mg. 50 (1900) 238-.
- , —, solubility. *Bruner, L.* C. R. 121 (1895) 59-.
- , —, specific heat. *Bruner, L.* C. R. 120 (1895) 912-.
- , —, calorimeter for. *Massol, G.* C. R. 130 (1900) 1126-.
- Superfusion and supersaturation. *Gernez, D.* [1873] Par. Sé. S. Ps. 1 (1873-74) 88-.
- , —, —. *Bruner, L.* Kosmos (Lw.) 21 (1896) 95-.

#### SPECIFIED SUBSTANCES.

- Metals and alloys. *Roberts-Austen, W. C.* R. S. P. 63 (1898) 447-.
- Nitrotoluene, floating drops. *Bachmetjev, P.* St. Pét. Ac. Sc. Mm. 10 (1900) No. 7, 63 pp.
- Phosphorus, fluidity at common temperatures. *Faraday, M.* QJ. Sc. 2 (1827) 469-.
- , superfusion and solidification. *Gernez, D.* C. R. 95 (1882) 1278-.
- Sulphur, fluidity at common temperatures. *Faraday, M.* QJ. Sc. 21 (1826) 392; (1827) (Pt. 2) 469-.
- , superfused, solidification, and new variety of sulphur. *Gernez, —.* Par. S. Ps. Sé. (1884) 14-.
- , superfusion and solidification. *Gernez, D.* C. R. 97 (1883) 1298-, 1366-, 1433-, 1477-.

## Supersaturation 1940

- Superfused salts, specific heat. *Bruner, L.* C. R. 121 (1895) 60-.
- Water. *Curtis, A. H.* Ph. Mg. 32 (1866) 422-.
- , *Krebs, G.* A. Ps. C. 146 (1872) 494-.
- , *Bordier, —.* Bordeaux S. Sc. Mm. 5 (1890) lxxxix-.
- , *Passy, J.* C. R. 123 (1896) 1409.
- , *Anon.* Sym. Met. Mg. 32 (1898) 1-.
- , crystals formed by release of pressure. *Amagat, E. H.* C. R. 117 (1893) 507-.
- , refractive index in state of supersaturation. *Damien, B. C.* J. de Ps. 10 (1881) 198-.
- and salt solutions in motion. *Monti, V.* Tor. Ac. Sc. At. 27 (1892) 94-.

#### SUPERHEATING.

- Neyreneuf, —.* Caen Ac. Mm. (1893) (Pt. 1) 3-.
- crystalline, velocity of transformation of octahedral and prismatic sulphur. *Gernez, —.* Par. S. Ps. Sé. (1884) 79-.
- of liquids, efflux under strong pressure. *Nicoli, N.* Rm. R. Ac. Linc. Mm. 2 (1895) 108-.
- , —, mechanical stimulus to boiling. *Gernez, D.* C. R. 86 (1878) 1549-.
- , —, and supersaturation of vapours. *Nichols, E. L.* [1884] Kan. Ac. Sc. T. 9 (1885) 91-.
- solutions, ebullition. *Walther-Meunier, H.* [1883] Mulhouse S. In. Bll. 55 (1885) 113-.
- , —, evaporation. *Gernez, D.* A. C. 7 (1876) 113-.
- in steam boilers. *Fayol, H.* St. Et. Bll. S. In. Mn. 13 (1884) 621-.
- and supersaturation, measurement. *Parenty, H.* C. R. 116 (1893) 867-.
- of water. *Donny, F.* (vi Add.) Majocchi A. Fis. C. 22 (1846) 264-.
- , —, *Dufour, L.* Sch. Nf. Gs. Vh. 48 (1864) 47-.

#### SUPERSATURATION.

- Lecoq de Boisbaudran, —.* C. R. 113 (1891) 832-.
- Martini, T.* Ven. I. At. (1892-93) 761-.
- of air with water vapour. *Schultheiss, —.* [1896] Karlsruhe Nt. Vr. Vh. 13 (1900) (Sb.) 29.
- dependence on crystalline form. *Nicol, K. W.* J. Edinb. R. S. P. 21 (1897) 473-.
- of liquids by their own vapour, objections. *Sanna-Solaro, —.* Les Mondes 26 (1871) 663-; 29 (1872) 451-.
- , —, —, —, — (Sanna-Solaro). *Tomlinson, C.* Les Mondes 27 (1872) 350-.
- vapours, heat developed on partial liquefaction. *Olearski, K., & Silberstein, L.* [1897] Krk. Ak. (Mt. Prz.) Rz. 13 (1898) 306-; Cro. Ac. Sc. Bll. (1897) 213.

#### SUPERSATURATED SOLUTIONS.

- Loewel, H.* C. R. 30 (1850) 163-; 32 (1851) 907-; 34 (1852) 642-; 35 (1852) 219-; 40 (1855) 481-, 1169-; 43 (1856) 709-; 44 (1857) 813-; 49 (1857) 32-.

- Gernez, D.* C. R. 60 (1865) 1027-; 61 (1865) 71-, 289-, 847-.
- Jeannel, J.* C. R. 61 (1865) 412-; A. C. 6 (1865) 166-.
- Viollette, C.* [1865] (xii) Par. Éc. Norm. A. 3 (1866) 205-.
- Jeannel, J.* C. R. 62 (1866) 37-.
- Lecoq de Boisbaudran, —.* A. C. 9 (1866) 173-; C. B. 63 (1866) 95-.
- Schiff, H.* N. Cim. 21 & 22 (\*1865-66) 35-; A. Ps. C. 129 (1866) 292-.
- (*Schiff.*) *Lindig, F.* [1866] A. Ps. C. 180 (1867) 144-.
- Lecoq de Boisbaudran, —.* C. R. 64 (1867) 1249-; 65 (1867) 111-; Par. Bll. S. C. 8 (1867) 3-, 65-; 9 (1868) 191-.
- Tomlinson, C.* Phil. Trans. 158 (1868) 659-.
- Lecoq de Boisbaudran, —.* A. C. 18 (1869) 246-; C. R. 68 (1869) 1829-; Par. Bll. S. C. 12 (1869) 33-.
- Marguerite, F.* C. R. 68 (1869) 1329.
- Tomlinson, C.* [1870] Phil. Trans. 161 (1871) 51-.
- Coppet, L. C. de.* C. R. 73 (1871) 1824-.
- Liversidge, A.* R. S. P. 20 (1872) 497-.
- Tomlinson, C.* R. S. P. 21 (1873) 208-.
- Lecoq de Boisbaudran, P. E.* C. R. 79 (1874) 802-.
- Gernez, D.* C. R. 79 (1874) 912-.
- (*Gernez.*) *Lecoq de Boisbaudran, P. E.* C. R. 79 (1874) 1074-.
- Pelloggio, P.* Mil. I. Lomb. Rd. 8 (1875) 607-.
- Grenfell, J. G.* [1876-77] R. S. P. 25 (1877) 124-; Nt. 15 (1877) 188; (xii) Bristol Nt. S. P. 2 (1879) 130-.
- (*Grenfell.*) *Tomlinson, C.* [1877-78] R. S. P. 26 (1878) 523-; 27 (1878) 121-.
- (*Tomlinson.*) *Grenfell, J. G.* C. N. 89 (1879) 16-, 141-.
- Tomlinson, C.* Nt. 20 (1879) 349-.
- Nicol, W. W. J.* Ph. Mg. 20 (1886) 295-.
- Tomlinson, C.* Ph. Mg. 21 (1886) 417-.
- Nicol, W. W. J.* C. S. J. 51 (1887) 389-.
- Potylcym, A.* [1889-92] Rs. Ps.-C. S. J. 21 (C.) (1889) 258-; C. S. J. 58 (1890) (Abs.) 333-; Vars. S. Nt. Tr. (1892-93) (C. R., Ps. C.) No. 3, 1-.
- action of isomorphs. *Lecoq de Boisbaudran, P. E.* C. R. 80 (1875) 888-.
- — low temperatures. *Tomlinson, C.* Ph. Mg. 40 (1870) 295-.
- — solids. *Henrici, F. C.* [1870] Freiburg B. 6 (1873) (Heft 1) 22-.
- — —. *Tomlinson, C.* R. S. P. 29 (1879) 24-.
- application of principle of unequal molecular conditions. *Pfaundler, L.* Wien Ak. Sb. 73 (1876) (Ab. 2) 574-.
- behaviour when exposed to open air. *Tomlinson, C.* R. S. P. 20 (1872) 41-.
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- and chemical constitution. *Coppet, L. C. de.* [1870-71] Laus. Bll. S. Vd. 10 (1868-70) 535-; 11 (1873) 7-.
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- — *Viollette, C.* C. R. 76 (1873) 713-.
- — *Gernez, D.* [1875-76] Par. Éc. Norm. A. 5 (1876) 9-; 7 (1878) 9-.
- — *Thomson, J. M.* [1886] R. I. P. 11 (1887) 508-.
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- and dissociation of dissolved salts. *Shecherbachev, A. A.* [1873] (xii) Rs. C. Ps. S. J. 6 (Pt. 1) (1874) 60-; (xi) St. Pét. Ac. Sc. Bll. 19 (1874) 42-.
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- and zinc lactates. *Coppet, L. C. de.* [1869] Laus. Bll. S. Vd. 10 (1868-70) 493-.
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- , effect of temperature on conductance. *Lenz, R.* [1869-70] St. Pét. Ac. So. Bll. 14 (1870) 54-; St. Pét. Ac. So. Mm. (Rs.) 18 (\*1870) (App. No. 2) 63 pp.
- , especially platinum. *Fischer, N. W.* Pogg. A. 19 (1850) 507-.
- , thermal conductance, variation with temperature. *Lodge, O. J.* Ph. Mg. 7 (1879) 198-, 251-; 8 (1879) 510-; L. Ps. S. P. 3 (1880) 23-, 141-.
- , — and electric conductance. *Hansemann, G., & Kirchhoff, G.* A. Ps. C. 18 (1881) 406-.
- , —, —, —. *Lorenz, L.* [1881] Kjøb. Dn. Vd. Selak. Skr. 2 (\*1881-86) 35-; A. Ps. C. 13 (1881) 422-, 582-.
- , —, —, —. *Berget, A.* J. de Ps. 9 (1890) 135-.
- , —, —, —. *Straneo, P.* Rm. R. Ac. Linc. Rd. 7 (1898) (Sem. 1) 197-, 310-.
- , —, —, —. *Aubel, E. van.* D. Ps. Gs. Vh. (1900) 3-.
- , —, —, — (van Aubel). *Jäger, W., & Diesselhorst, H.* D. Ps. Gs. Vh. (1900) 39-.
- , —, —, — (Jäger and Diesselhorst). *Aubel, E. van.* D. Ps. Gs. Vh. (1900) 77-.
- , —, —, —. *Riecke, E.* A. Ps. 2 (1900) 835-; Gött. Nr. (1900) 250-.
- , —, —, —. *Grüneisen, E.* A. Ps. 3 (1900) 43-.
- , —, —, — on electron theory. *Reinganum, M.* A. Ps. 2 (1900) 398-.
- , —, —, —, heat capacity and thermo-electric power. *Jaeger, W., & Diesselhorst, H.* Berl. Ak. Sb. (1899) 719-; Berl. Ps. Reichsanst. Ab. 3 (1900) 269-.
- Minerals, etc., conductance, measurement. *Jannettaz, É.* Par. S. Ps. Sé. (1885) 6.
- , fibrous. *Jannettaz, É.* Par. S. Gl. Bll. 6 (1878) 203-.
- and rocks. *Thoulet, J.* A. C. 20 (1880) 362-; C. R. 94 (1882) 1047-; A. C. 26 (1882) 261-.
- Nickel. *Baillie, T. C.* Edinb. B. S. T. 39 (1900) 361-.

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- Non-isotropic bodies, conduction in, lecture experiment. *Sella, A. N. Cim.* 10 (1899) 186-.
- Organic substances, conduction in. *Greiss, C. B. A. Ps. C.* 139 (1870) 174-.
- Phosphor-copper and arsen-copper, thermal and electric conductivity. *Rietzsch, A. A. Ps.* 3 (1900) 403-.
- Plates, conduction in, from hot gases to water. *Halliday, G.* [1898] *Glasg. I. Eng. T.* 42 (1899) 41-.
- with variously arranged surfaces, conduction in. *Walker, W. G. Elect.* 35 (1895) 788-.
- Porous moist substances. *Andrée, S. A.* [1890] *Stockh. Ak. Hndl. Bh.* 16 (*Afd.* 1) (1891) *No. 7, 7 pp.*; *Fschr. Ps.* (1890) (*Ab.* 2) 381.
- Rocks. *Herschel, A. S. B. A. Rp.* 43 (1873) (*Sect.*) 40.
- (St. Gothard). *Weber, R. H. Neuch. S. Sc. Bll.* 12 (1880) 687-.
- *Prestwich, J.* [1865] *R. S. P.* 41 (1867) 1-.
- *Stadler, G. Zür. Vjschr.* 34 (1899) 12-.
- , conductance, temperature variation. *Forbes, J. D. B. A. Rp.* (1840) 434-.
- , —, —. *Kelvin, (Lord), & Murray, J. R. E. R. S. P.* 58 (1895) 162-.
- , —, —. *Weber, R. Nt.* 52 (1895) 458-.
- , —, —. *Peirce, B. O., & Willson, R. W.* [1895] *Nt.* 53 (1895-96) 4.
- (Campagna), external and internal conductance. *Morano, F. Rm. R. Ac. Linc. Rd.* 7 (1898) (*Sem.* 2) 61-, 83-, 857.
- and solids in general. *Jamettaz, É. C. B.* 78 (1874) 1202-.
- Salts. *Lees, C. H. Manch. Lt. Ph. S. Mm. & P.* 42 (1898) *No. 5, 4 pp.*
- Selenium, action of light. *Bellati, M., & Lussana, S. Ven. I. At.* (1886-87) 1117-.
- Snow. *Hjeltström, S. A. Stockh. Öfv.* (1889) 689-; *J. de Ps.* 10 (1891) 142-.
- Soils. *Forbes, J. D. Edinb. R. S. P.* 1 (1845) 343-.
- Steam-pipes, non-conducting coverings for. *Ordway, J. M. Franklin I. J.* 86 (1883) 411-.
- Steel, manganese-. *Mitchell, A. C. Edinb. R. S. T.* 35 (1890) 947-.
- , mild. *Hall, E. H. Am. Ac. P.* 31 (1896) 271-.
- , — and hard. *Kohlrausch, F. Würzb. Ps. Md. Sb.* (1887) 120-.
- plates, conduction in. *Blechynden, A. Nv. Archt. T.* 35 (1894) 70-.
- Stones. *Perry, J., & Ayrton, W. E. Ph. Mg.* 5 (1878) 241-.
- *Peirce, B. O., & Willson, R. W. Am. Ac. P.* 34 (1899) 1-.
- Tourmaline. *Senarmon, H. de. A. C.* 28 (1850) 279.
- *Stenger, F. A. Ps. C.* 22 (1884) 522-.
- Tube plates, conduction through. *Durston, A. J. Nv. Archt. T.* 34 (1893) 130-.
- Vulcanite. *Peirce, B. O. Am. Ac. P.* 35 (1900) 73-; *Ph. Mg.* 49 (1900) 15-.
- Walls, conduction in. *Ferrini, R. Mil. I. Lomb. Rd.* 31 (1898) 479-.

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- Walls, conduction of solar heat in. *Provenzani, F. S. Rm. N. Linc. At.* 34 (1881) 143-.
- of cylinders of steam-engines, conduction in. *Henrotte, J., & Yssel de Schepper, J. H. A. Bv. Un. Mines* 6 (1889) 40-, 129-.
- safes, resistance to passage of heat. *Ruff, F. Dingler* 300 (1896) 173-.
- , —, —, —, —. *Russmer, —. Dingler* 301 (1896) 95-.
- Wire heated equally at ends, steady state. *Hearn, G. W. Ph. Mg.* 29 (1846) 22-.
- Wood. *Hoh, T. (xii) Bamb. Nf. Gs. B. (11)* (1878) (*Pt. 1, No. 3*) 17 pp.
- , anisotropic conductance. *Decandolle, A., & De la Rive, A. Gen. Mm. S. Ps.* 4 (1828) 70-.
- , —. *Tyndall, J. B. A. Rp.* (1852) (*pt. 2*) 20.
- and stone. *Less, E.* [1877] *A. Ps. C. (Ergänz.)* 8 (1878) 517-.

## 2030 Liquids, Conductance of.

- Dalton, J.* [1799] *Manch. Ph. S. Mm.* 5 (1802) 373-.
- Nicholson, W. Nicholson J.* 5 (1802) 197-.
- Murray, (Dr.) J. Nicholson J.* 1 (1802) 165-, 241-.
- Traill, T. S. Nicholson J.* 12 (1805) 133-.
- Böckmann, C. W. Rot. N. Vh.* 6 (1827) 1-.
- Despretz, C. C. R.* 8 (1839) 879-.
- Guthrie, Fred.* [1868] *Phil. Trans.* 159 (1869) 637-.
- Paalzow, A. A. Ps. C.* 134 (1868) 618-.
- Despretz, C. C. R.* 72 (1871) 484-.
- Winkelmann, A. A. A. Ps. C.* 153 (1874) 481-.
- Beetz, W. Münch. Ak. Sb.* 9 (1879) 86-.
- Baumgartner, G. Carl Rpm.* 17 (1881) 586-.
- Graetz, L.* [1882-85] *A. Ps. C.* 18 (1883) 79-; 25 (1885) 337-.
- Weber, H. F. Berl. Ak. Sb.* (1885) 809-.
- Apparatus. *Evans, W. P.* [1896] *N. Z. I. T.* 31 (1899) 555-.
- Conductance in solid and liquid states. *Stuginov, N. Ra. Ps.-C. S. J.* 23 (*Ps.*) (1891) 456-; *J. de Ps.* 1 (1892) 405-.

### CONDUCTION IN LIQUIDS.

- Thomson, T. Nicholson J.* 4 (1801) 529-.
- Rumford, B. (Count). Nicholson J.* 14 (1806) 353-.
- Prevost, P. J. de Ps.* 72 (1811) 168-.
- Fourier, J. B. J.* [1820] *Par. Mm. Ac. Sc.* 12 (1833) 507-.
- Despretz, C. C. R.* 7 (1838) 933-; 8 (1839) 888-; *A. C.* 71 (1839) 206-.
- Guthrie, Fred. Ph. Mg.* 35 (1868) 283-.
- Paalzow, —. D. Nf. Tbl.* (\*1868) 170-.
- Weber, H. F. Zür. Vjschr.* 24 (1879) 252-, 355-.
- (Weber.) *Winkelmann, A. A. A. Ps. C.* 10 (1880) 668-.
- (Winkelmann.) *Weber, H. F. A. Ps. C.* 11 (1880) 347-.
- (Weber.) *Winkelmann, A. A. A. Ps. C.* 11 (1880) 784-.
- Chree, C. B. S. P.* 43 (1888) 30-.

- Kristensen, K. S.* Ts. Ps. C. 31 (1892) 97-  
with convection. *Oberbeck, A.* A. Ps. C.  
7 (1879) 271-.  
in motion. *Duhamel, J. M. C.* C. R. 47 (1858)  
5-, 129-, 175-.  
— —. *Šeduev, G.* Kazan S. Ps.-Mth. Bil.  
1 (1891) 22-.

- Mixtures and their constituents. *Lees, C. H.*  
[1895-99] B. A. Rp. (1895) 628; L. Ps. S. P.  
17 (1901) 78-; Ph. Mg. 49 (1900) 286-.  
Temperature variation. *Lees, C. H.* [1897]  
Phil. Trans. (A) 191 (1898) 399-.

## SPECIFIED LIQUIDS.

- Mercury. *Gripou, É.* [1866] C. R. 63 (1866)  
51-; (xii) Lille S. Mm. 3 (1867) 179-.  
— *Herwig, H.* [1873-80] A. Ps. C. 151  
(1874) 177-; 10 (1880) 662-.  
— (Herwig). *Weber, H. F.* A. Ps. C. 11  
(1880) 345-.  
— *Berget, A.* C. R. 105 (1887) 224-; 106  
(1888) 1152-; 107 (1888) 171-; Par. S. Ps.  
Sé. (1888) 335-.  
— and amalgams. *Johnson, R., & Crace-  
Calvert, F.* Phil. Trans. (1859) 881-.  
Organic liquids. *Heen, P. de.* Brux. Ac. Bil.  
18 (1889) 192-.  
Saline solutions. *Jäger, G.* Wien Ak. Sb.  
99 (1891) (Ab. 2a) 245-.  
Water. *Bottomley, J. T.* [1879] Phil. Trans.  
173 (1881) 537-.  
— *Milner, S. R., & Chattock, A. P.* [1898]  
Ph. Mg. 48 (1899) 46-.  
— and alcohol mixtures. *Henneberg, H.* A.  
Ps. C. 36 (1889) 146-.  
—, conductance, and conduction in system of  
cylinders. *Lorberg, H.* A. Ps. C. 14 (1881)  
291-, 426-.  
— heated at the top in stone boiler. *Horn-  
blower, J. C.* Nicholson J. 8 (1804) 169-.  
— as non-conductor. *Mather, W. W.* Silliman  
J. 13 (1828) 368-.  
—, warming in tubes. *Forchheimer, P.* Hann.  
Arch.-Vr. Z. 34 (1888) 175-; 35 (1889) 609-.

## 2035 Gases, Conductance of.

- Mohr, C. F.* Bonn SB. Niedr. Gs. (1869) 196;  
Z. Mth. Ps. 15 (1870) 269-.  
(Mohr.) *Clausius, R.* D. C. Gs. B. 4 (1871)  
269-.  
*Ronkar, E.* Brux. Ac. Bil. 8 (1884) 204-.  
*Smoluchowski, M.* Prace Mt.-Fiz. 10 (1899-  
1900) 33-.  
Apparatus. *Kundt, A.* A. Ps. C. 2 (1877) 384-.  
— *Wood, R. W.* Ps. Rv. 6 (1898) 165-.  
Conductance at low temperatures. *Eckerlein,  
P. A.* A. Ps. 3 (1900) 120-.

## CONDUCTION IN GASES.

- Fourier, J. B. J.* [1820] Par. Mm. Ac. Sc.  
12 (1833) 507-.  
*Magmus, G.* Berl. Mb. (1860) 485-.  
*Clausius, R.* Pogg. A. 115 (1862) 1-.

- Stefan, J.* [1872-75] Wien Sb. 65 (1872)  
(Ab. 2) 45-; 72 (1876) (Ab. 2) 89-.  
*Boltzmann, L.* [1875] Wien Ak. Sb. 72 (Ab.  
2) (1876) 458-.  
*Winkelmann, A. A.* A. Ps. C. 156 (1875) 497-;  
157 (1876) 497-.  
*Schleiermacher, A.* A. Ps. C. 34 (1888) 623-.  
*Winkelmann, A.* A. Ps. C. 44 (1891) 177-,  
429-.  
*Graetz, L.* A. Ps. C. 45 (1892) 298-.  
(Graetz.) *Winkelmann, A.* A. Ps. C. 46 (1892)  
323-.  
*Weber, L.* [1894] Schl.-Holst. Nt. Vr. Schr.  
10 (1895) 313.  
effect of density. *Winkelmann, A. A.* A. Ps.  
C. 11 (1880) 474-.  
— — temperature. *Winkelmann, A. A.* A.  
Ps. C. 19 (1883) 649-; 29 (1886) 68-.  
— —. *Eichhorn, W.* A. Ps. C. 40 (1890)  
697-.  
at high temperatures. *Winkelmann, A. D.*  
Nf. Tbl. (\*1879) 181.  
rarefied. *Smoluchowski, M.* (Ritter) von Smolan.  
A. Ps. C. 64 (1898) 101-; Ph. Mg. 46 (1898)  
192-.  
— *Gehrcke, E.* A. Ps. 2 (1900) 102-.  
—, and friction. *Kundt, A., & Warburg, E.*  
A. Ps. C. 155 (1875) 337-, 525-; 156 (1875)  
177-.  
and vapours. *Winkelmann, A. A.* A. Ps. C.  
159 (1876) 177-.

- Mixtures. *Plank, J.* [1875] Wien Ak. Sb.  
72 (1876) (Ab. 2) 269-.  
Temperature variation. *Graetz, L.* A. Ps. C.  
14 (1881) 232-.  
— (Graetz). *Winkelmann, A. A.* A. Ps. C.  
14 (1881) 534-.  
— (Winkelmann). *Graetz, L.* A. Ps. C.  
14 (1881) 541-.  
Vapours, temperature and pressure variations.  
*Magnanini, G., & Zunino, V.* Mod. Ac. Sc.  
Mm. 2 (1900) 87-.

## SPECIFIED GASES.

- Air (rarefied). *Crookes, W.* [1890] R. S. P.  
31 (1881) 239-.  
— *Winkelmann, A.* A. Ps. C. 48 (1893)  
180-.  
— *Müller, E.* A. Ps. C. 60 (1897) 82-.  
— and hydrogen. *Buff, H.* A. Ps. C. 158  
(1876) 177-; Berl. Ak. Mb. (1876) 89; Arch.  
Sc. Ps. Nt. 57 (1876) 293-.  
— —, temperature coefficient. *Winkelmann,  
A. A.* A. Ps. C. 1 (1877) 63-.  
—, temperature variation. *Müller, E.* [1900]  
Ps. Z. 2 (1901) 161-.  
—, use as bad conductor. *Bodde, B.* Hermb-  
städt Bil. 9 (1811) 161-.  
Mercury vapour. *Schleiermacher, A.* A. Ps.  
C. 36 (1889) 346-.  
Nitrogen, nitric oxide, ammonia and illumina-  
ting gas. *Plank, J.* [1876] Wien Ak. Sb.  
74 (1877) (Ab. 2) 215-.

## 2040 Convection. Laws of Cooling. (See 4210.)

## CONVECTION.

- Rumford, B. (Count).* Nicholson J. 1 (1797) 289-, 341-, 563-; Gilbert A. 1 (1799) 214-, 323-; 2 (1799) 249-.
- (*Rumford.*) *De Luc, G. A.* (vi *Adds.*) Gilbert A. 1 (1799) 464-.
- (—) *Biot, J. B.* Par. S. Phlm. Bll. 3 (1801) 36-.
- (—) *Parrot, G. F.* Gilbert A. 17 (1804) 257-, 369-; 22 (1806) 148-.
- Air currents, ascending and descending, temperature differences. *Richarz, F. D.* Nf. Vh. (1900) (*Th. 2, Hälfte 1*) 21-.
- in mines, resistance to. *Elwen, T. L.* [1889] N. Eng. I. Mn. E. T. 38 (1891) 205-.
- — — — —. *Murgue, D.* [1893-94] Fed. I. Mn. E. T. 6 (1894) 135-, 418-; 7 (1894) 211-.
- — — — —. *Elwen, T. L.* [1895] N. Eng. I. Mn. E. T. 45 (1896) 62-.
- and other gases, flow. *Gordon, F. W.* [1885] Am. I. Mn. E. T. 14 (1886) 146-.
- , hot, ascent through tubes. *Anon.* (vi 1063) QJ. Sc. (1829) (*Pt. 1*) 179.
- , —, flow in pipes. *Schreiber, F.* Karsten Arch. 12 (1839) 121-.
- Cellular vortices in liquid. *Bénard, H.* Par. S. Ps. Sé. (1900) 213-.
- Chimney draught. *Avit, —.* Le Puy A. S. Ag. (1828) 215-.
- — —. *Förster, C. F. L.* Förster Al. Bauztg. 22 (1857) 88-.
- — —, supposed effect of sunlight. *Kohlrausch, F.* Würzb. Ps. Md. Sb. (1881) 151-.
- — —, thermodynamics. *Frazier, B. W.* Am. I. Mn. E. T. 10 (\*1882) 249-.
- Chimneys, factory. *Cordier, E.* St. Ét. Bll. S. In. Mn. 2 (1888) 535-.
- Circulation in atmosphere, dynamics. *Bjerknes, V.* [1899] Met. Z. 17 (1900) 97-, 145-.
- — hot water pipes, theory. *Ricco, A.* Palermo G. Sc. Nt. 17 (1886) 9-.
- — tubular boilers. *Brillié, H.* Gén. Civ. 32 (1897-98) 75-, 95-, 114-, 264-, 282, 297-, 313-; 34 (1898-99) 134-, 147-, 165-, 181-, 195-; 35 (1899) 342-, 357-, 378-, 388-, 405-.
- — vertical glass tubes. *Dutrochet, H.* A. C. 48 (1831) 268-.
- Convection by air currents. *Mitchell, A. C.* [1899] Edinb. R. S. T. 40 (1905) 39-.
- in air, fundamental formula. *Käuffer, P.* Carl Rpm. 18 (1882) 200-.
- and conduction in flowing liquids. *Šebuev, G.* Kazan S. Ps.-Mth. Bll. 1 (1891) 22-.
- currents. *Richarz, F., & Lonnes, C.* Z. Ps. C. 20 (1896) 145-.
- in air and liquids. *Czermak, P.* A. Ps. C. 50 (1893) 829-.
- — liquid. *Parrot, G. F.* Gilbert A. 19 (1805) 453-.
- Convection currents in liquid. *Oberbeck, A.* A. Ps. C. 11 (1880) 489-.
- — — — —; steady motion; vortices. *Bénard, H.* C. R. 130 (1900) 1004-, 1065-; Par. S. Ps. Sé. (1900) 202-.
- — — — — melted wax. *Tomlinson, C. B. A.* Rp. 86 (1886) (*Sect.*) 44-.
- — —, supposed. *Thomson, T.* Nicholson J. 1 (1802) 81-.
- , diffusive. *Griffiths, A.* L. Ps. S. P. 16 (1899) 230-; Ph. Mg. 46 (1898) 453-.
- , —, source of energy. *Griffiths, A.* L. Ps. S. P. 16 (1899) 435-; Ph. Mg. 47 (1899) 522-.
- in gas. *Lorentz, H. A.* Amst. Ak. Vs. M. 17 (1882) 179-; Arch. Néerl. 17 (1882) 193-.
- scope and calorimeter. *Bennett, A. R.* Manch. Lt. Ph. S. Mm. & P. 41 (1897) xxvii-.
- thermometer. *Cooley, Le R. C.* Franklin I. J. 66 (1873) 343-; 67 (1874) 408-; 70 (1875) 134-; 74 (1877) 326-.
- Draught controller. *Gauthier, G. A.* Mines 11 (1847) 117-.

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- Dust photographs. *Thiselton-Dyer, W. T.* Nt. 47 (1892-93) 341-.
- — —. *Allen, F. J.* Nt. 47 (1892-93) 342.
- — — and breath figures. *Croft, W. B.* Nt. 47 (1892-93) 364.
- and smoke, electrical deposition. *Lodge, O.* [1886] R. I. P. 11 (1887) 520-; S. C. In. J. 5 (1886) 572-.
- Dusty air near strongly illuminated bodies. *Lodge, O. J., & Clark, J. W.* L. Ps. S. P. 6 (1885) 1-; Ph. Mg. 17 (1884) 214-.
- Soot-figures on ceilings. *Poulton, E. B.* Nt. 47 (1892-93) 608.
- — — — —. *Lodge, O.* Nt. 47 (1892-93) 608.
- — — — —. *Irving, A.* Nt. 48 (1893) 29.
- — — — —. *Mill, H. R.* Nt. 48 (1893) 29.
- — — — —. *Cunningham, A.* Nt. 48 (1893) 29.
- — — — —. *Poulton, E. B.* Nt. 48 (1893) 29.
- — — — —. *Clark, J. E.* Nt. 48 (1893) 77.
- Heating surface in ventilating flues. *Trowbridge, W. P.* Sch. Mines Q. N. Y. 3 (\*1882) 171-.
- Ice divide, movement during melting of inland ice. *Schütz, O. E.* N. Mg. Ntvd. 34 (1895) 102-.
- Radiation from heated wire in dusty air, formation of dark plane. *Rayleigh, (Lord).* [1882] R. S. P. 34 (1883) 414-.
- Rayleigh's dark plane. *Lodge, O. J.* Nt. 28 (1883) 297-.
- Stream-lines in fluids. *Bezold, W. von.* Münch. Ak. Sb. 14 (1885) 611-.
- Temperature of room indicated by thermometers at different heights. *Murray, J.* Tilloch Ph. Mg. 59 (1822) 51-.
- Ventilation by heat, problem. *Buchan, W. P.* [1890] Glasg. Ph. S. P. 22 (1891) 81-.

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- Ventilation by heated chimneys and fans, relative economy. *Trowbridge, W. P.* Sch. Mines Q. N. Y. 7 (1896) 347-.
- and heating of buildings, thermal tests. *Morrison, C. B.* Am. As. P. (1899) 179-.
- — systems. *Haase, F. H.* Dingler 277 (1890) 597-; 278 (1890) 351-; 279 (1891) 38-, 91-, 108-, 126-, 225-, 312; 280 (1891) 175-, 268-; 282 (1891) 31-, 57-, 237-, 304; 284 (1892) 63-, 109-, 194-, 182-, 206-.
- , hygienic. *Bishop, J. Le M.* [1895] Br. Archt. J. 3 (1896) 36-.
- and illuminants. *Lewes, V. B.* Br. Archt. T. 4 (1888) 77-.
- , methods. *Ferrini, T.* Mil. I. Lomb. Rd. 18 (1885) 873-.
- , mines. *Brabant, F.* Brux. A. Tr. Pbl. 42 (1885) 1-, 205.
- , —. *Larmoyeux, —.* Brux. A. Tr. Pbl. 46 (1889) 279-.
- , —. *Hausse, R.* Civing. 40 (1894) 565-; 41 (1895) 19-.
- in Russian climate. *Lenz, E.* St. Pet. Ac. Sc. Mm. (Rs.) 3 (\*1863) (App. No. 3) 89 pp.
- tables. *Pearce, F. H.* N. Eng. I. Mn. E. T. 33 (1894) 93-.
- , theory. *Shaw, W. N.* B. A. Rp. (1890) 730-.
- , tunnels, Saccardo's system. *Bassani, C.* Rv. Sc.-Ind. 23 (1891) 263-.
- , —, —. *Champy, L.* A. Mines 17 (1900) 167-.

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- action of air currents. *Oberbeck, A. A.* Ps. C. 56 (1895) 397-.
- — Röntgen rays. *Pettinelli, P.* N. Cim. 8 (1898) 299-.
- — —, question. *Amerio, A.* N. Cim. 10 (1899) 366-.
- with allowance for heat due to contraction. *Lévy, M.* C. R. 83 (1876) 186-.
- body in gas. *Prevost, P.* Gen. Mm. S. Ps. 4 (1828) 265-.
- — —, rate. *Prevost, P.* A. C. 40 (1829) 332-.
- and conduction in gases. *Narr, F.* [1870] A. Ps. C. 142 (1871) 123-.
- cylindrical bar, motion of points. *Duhamel, J. M. C.* C. R. 39 (1854) 1185-; Par. Éc. Pol. J. 36<sup>e</sup> cah. (1856) 1-.
- effect of dimensions. *Bottomley, J. T.* B. A. Rp. (1884) 623-.
- by gases. *Desains, P., & La Provostaye, F. de.* C. R. 22 (1846) 77-.
- heterogeneous solid rod. *Steklov, V. A.* Kharkov Mth. S. Com. 5 (1896?) 136-; Fschr. Ps. (1897) (Ab. 2) 348.
- Kelvin's equation. *Heelis, J.* Manch. Lt. Ph. S. P. 18 (1879) 83-.
- law. *Quet, —.* C. R. 16 (1843) 1435-.
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- — —, experiments. *Morosi, G.* [1816] Mil. Mm. I. Lomb. Ven. 3 (1816-17) 137-.
- — —, origin. *Rumford, B.* (*Count*). Scherer J. C. 1 (1798) 9-.
- theories, various. *Prouhet, E.* Les Mondes 4 (1864) 762-.
- theory. *Fouré, J.* Par. S. Md. Ém. Mm. 6 (1802) 418-.
- — —. *Babbini, G.* Firenze A. Ms. Imp. 1 (1808) 25 pp.
- — —. *Fourier, J. B. J.* A. C. 3 (1816) 350-.
- — —. *Dulong, P. L., & Petit, A. T.* A. C. 10 (1819) 395-.
- — —. *Bischoff, T. L. W.* D. Nf. Vsm. B. (1837) 27-.
- — —. *Résal, H. A.* C. R. 84 (1877) 975-; 92 (1881) 157-.
- — —, historical study. *Laboulaye, C.* (viii) Par. A. Cons. 1 (1861) 55-.
- — —, newer developments. *Planck, M. D. Nf.* Vh. (1891) (*Th.* 2) 55-.
- — —, undulatory. *Mann, F.* Schlämilch Z. 2 (1857) 280-; 3 (1858) 57-.
- — —, vibratory. *Moutier, J.* Par. S. Phlm. Bl. 2 (1878) 99-.
- Heating of gas by compression according to kinetic theory. *Voigt, W.* Gött. Nr. (1885) 228-.
- History. *Tait, P. G.* Ph. Mg. 28 (1864) 288-.
- — — and applications. *Mansel, R.* Glasg. I. Eng. T. 25 (1882) 85-.
- Hypothesis of molecular motions. *Rankine, W. J. M.* Ph. Mg. 41 (1871) 62-.
- Increase of temperature produced in water by agitation. *Reade, J.* Nicholson J. 20 (1808) 113-.
- Integral of *vis viva*. *Duhem, P.* Liouv. J. Mth. 4 (1898) 5-.
- Internal latent heat. *Avenarius, M.* [1873] Mosc. Bl. S. Nt. 46 (*pt.* 2) (1874) 117-.
- — — motions of solids. *Paoli, D.* Brugnattelli G. 2 (1819) 59-, 109-; 3 (1820) 209-; 5 (1822) 17-; G. Arcad. 4 (1819) 106-.
- — — pressure and virial of internal forces in fluids. *Amagat, E. H.* Par. S. Ps. Sé. (1895) 62-.
- — — work, equivalent of temperature, and molecular meaning of specific heat. *Subic, S.* Wien SB. 48 (*Ab.* 2) (1863) 62-.
- Kinetic energy of heat-motion, and dissipation function. *Natanson, W.* [1894] Krk. Ak. (*Mt.-Prz.*) Rz. 7 (1895) 273-; Ph. Mg. 39 (1895) 501-; Z. Ps. C. 16 (1895) 289-.
- Kistjakovskij's results. *Schiller, N. N.* Rs. Ps.-C. S. J. 30 (*Ps.*) (1898) 175-.
- Lagrange's equations and thermodynamics. *Farkas, G.* Orv.-Termt. Éts. (*Termt. Szak*) (1890) 289-.
- Material systems. *Sarrau, É.* J. de Ps. 2 (1873) 318-.
- Mathematics, application to physics. *Heringa, P. M.* N. Arch. Wisk. 7 (\*1881) 1-.
- — — and energetics. *Boltzmann, L.* A. Ps. C. 57 (1896) 39-.
- Maxwell's law, thermodynamical interpretation. *Natanson, W.* Prace Mt.-Fiz. 5 (1894) 118-; Z. Ps. C. 14 (1894) 151-.
- Mechanical hypotheses, use in science, especially in theory of heat. *Rankine, W. J. M.* [1862] Glasg. Ph. S. P. 5 (1864) 128-.
- Modern kinetics and dynamics of the future. *Hirn, G. A.* Brux. Ac. Mm. 46 (1886) (*No.* 7) 82 pp.
- Molecular motion and pressure in metals. *Slotte, K. F.* Helsingf. Öfv. 35 (1893) 16-; 37 (1895) 178-; 38 (1896) 64-; Fsch. Ps. (1896) (*Ab.* 2) 226-.
- — — of solids. *Paoli, D.* G. Arcad. 29 (1826) 3-, 145-.
- — — pressure, thermodynamical consideration. *Bakker, G.* Z. Ps. C. 13 (1894) 145-.
- Monocyclic systems, statics. *Helmholtz, H. von.* Berl. Ak. Sb. (1884) 159-, 311-, 755-; Crelle J. Mth. 97 (1884) 111-, 317-.
- — —. *Suslov, G.* Mosc. S. Sc. Bl. 92 (*No.* 1) (1896) 24 (*bis*)-.
- — —, generalised laws. *Helmholtz, H. von.* Berl. Ak. Sb. (1884) 1197-.
- — —, new proof of Helmholtz's theorem. *Boltzmann, L.* Gött. Nr. (1886) 209-.
- Motivity and energy as basis of thermodynamics. *Kelvin, (Lord).* Edinb. R. S. P. 22 (1900) 126-.
- Multiple compression. *Ká, A.* Oestr. Z. Brgw. 41 (1893) 327-, 339-.
- Osmotic pressure, so-called. *Meyer, L. A.* Ps. C. 46 (1892) 167-.
- Permanent change and thermodynamics. *Duhem, P.* Z. Ps. C. 22 (1897) 545-; 23 (1897) 193-, 497-; 24 (1897) 666; 28 (1899) 577-; 33 (1900) 641-; 34 (1900) 312-, 683-.
- Principles. *Walter, A.* D. Nf. B. (\*1877) 104-.
- — —. *Pirogov, N. N.* Rs. Ps.-C. S. J. 22 (*Ps.*) (1890) 173-; Fsch. Ps. (1890) (*Ab.* 1) 231-.
- — —. *Gosiewski, W.* Wiad. Mt. 2 (1898) 7-, 123-.
- — —, attempted mechanical explanation. *Poincaré, H.* C. R. 108 (1889) 550-.
- — —, commentary. *Duhem, P.* Liouv. J. Mth. 8 (1892) 269-; 9 (1893) 293-; 10 (1894) 207-.
- — —, demonstration. *Ledieu, A.* C. R. 77 (1873) 94-, 163-, 260-, 325-, 414-, 455-, 517-.
- Probability and kinetic theory of heat. *Desaulx, (le rév. père) J.* Rv. Quest. Sc. 28 (1890) 484-.
- Proposition. *Hopkinson, J.* Mess. Mth. 5 (1871) 162-.
- Statistical mechanics, fundamental formula. *Gibbs, J. W.* Am. As. P. (1884) 57-.
- Sun, thermodynamics. *Rudzki, M. P.* Ph. Mg. 37 (1894) 304-.
- Technical thermodynamics, contribution. *Hübers, J.* Dingler 313 (1899) 168-; 314 (1899) 92-, 184; 315 (1900) 64-.

## 2400 Dynamics of Heat

- Technical thermodynamics, contribution (Hübers). *Voss, H.* Dingler 314 (1899) 184.
- Temperature differences produced by motion in liquid. *Cantoni, G.* Mil. I. Lomb. Bd. 1 (1864) 145-.
- , laws. *Meikle, H.* Thomson A. Ph. 12 (1826) 366-.
- and quantity of heat of bodies. *Puschl, K.* Wien Sb. 62 (1870) (Ab. 2) 171-.
- represented by wave-length of calorific oscillations. *Pictet, R.* C. R. 88 (1879) 855-.
- Thermal coefficients. *Trevor, J. E.* J. Ps. C. 8 (1899) 523-.
- and dynamic coefficients. *Trevor, J. E.* J. Ps. C. 8 (1899) 573-.
- Thermodynamic acceleration and retardation of streams. *Rankine, W. J. M.* Ph. Mg. 40 (1870) 288-.
- concordance, law. *Natanson, W.* Kosmos (Lw.) 17 (1892) 131-; Z. Ps. C. 9 (1892) 26-.
- deductions. *Pazienti, A.* [1866-73] Ven. Mm. I. 13 (1866) 129-; 14 (1868) 169-; (x) 18 (1874) 163-.
- observations. *Natanson, W.* A. Ps. C. 42 (1891) 178-.
- phenomena, mechanical image. *Chaperon, —.* C. R. 109 (1889) 852-.
- study of general properties of matter. *Lucas, F. C. R.* 104 (1887) 1083-.
- uniformity. *Kamerlingh Onnes, —.* Amst. Ak. Vs. 4 (1896) 236-, 271-.
- Thermodynamics of living beings. *Hirn, G. A.* Bv. Sc. 39 (1887) 673-, 714-, 779-.
- — luminescence. *Wesendonck, K. A.* Ps. C. 62 (1897) 706-.
- — —. *Wiedemann, E.* A. Ps. C. 66 (1896) 1180-.
- Thermomechanical phenomena. *Duhamel, J. M. C.* [1835] Par. Éc. Pol. J. cah. 25 (1837) 1-.
- Thermostatics. *Grolous, J.* Par. S. Phlm. Bll. 12 (1875) 62-; As. Fr. C. R. 5 (1876) 75-.
- Transformation of heat-diagrams. *Morin, P.* C. R. 61 (1865) 477-.
- — material body. *Gosiewski, W.* Krk. Ak. (Mt.-Prz.) Rz. 7 (1895) 118-; Cro. Ac. Sc. Bll. (1893) 311-.
- temperatures, influence of pressure. *Lusana, S. N.* Cim. 1 (1895) 97-.
- Transmutation of matter, new suggestion. *Harper, H. W.* Texas Ac. Sc. T. 2 (No. 2) (1899) 84-.
- Universe and natural laws. *Pellat, H.* Arch. Néerl. 5 (1900) 43-.
- Vibratory condition of bodies as basis of theory of heat. *Ledieu, A. C. H.* C. R. 81 (1875) 130-.
- Wind-waves. *Emden, R.* A. Ps. C. 62 (1897) 874-.
- Work of Willard Gibbs. *Duhem, P.* Bll. So. Mth. 11 (1887) 122-.

## Conservation of Energy 2405

### 2405 The First Law. Conservation of Energy. Different Forms of Energy.

- Coal, electricity directly from. *Bucherer, A. H.* Franklin I. J. 139 (1895) 378-.
- , substitution of other sources of energy for. *Cohn, P.* Königab. Schr. 36 (1895) [17]-.

#### CONSERVATION OF ENERGY.

- Helmholtz, H.* [1847] Taylor Sc. Mm. (Nt. Ph.) (1853) 114-.
- (Helmholtz.) *Clausius, R.* Pogg. A. 89 (1853) 568-; 91 (1854) 601-.
- (Clausius.) *Helmholtz, H.* Pogg. A. 91 (1854) 241-.
- Faraday, M.* [1857] R. I. P. 2 (1854-58) 352-.
- Rankine, W. J. M.* Ph. Mg. 17 (1859) 250-, 347-.
- Henry, J.* Silliman J. 30 (1860) 32-.
- Blaserna, P.* (vi Add.) Palermo G. I. Inc. (1863) (pte. 3) 121-.
- Akin, C. K.* Ph. Mg. 29 (1865) 205-.
- Brooke, C.* Nt. 6 (1872) 122-.
- Colley, R.* (xii) Kazan Un. Mm. (1880) (Pt. 2) 1-.
- Provenzali, F. S.* Rm. N. Linc. At. 33 (1880) 124-.
- Terquem, A.* Rv. Sc. 18 (1880) 679-.
- Metz, —.* [1884] Offenb. Vr. Nt. B. 24 & 25 (1885) 55-.
- and action at a distance. *Lodge, O. J.* Ph. Mg. 11 (1881) 36-, 220, 529-.
- aerodynamic equations. *Koláček, F. A.* Ps. C. 41 (1890) 151-.
- history. *Colding, L. A.* [1863] (vii) Ph. Mg. 27 (1864) 56-.
- *Bohn, C.* Ph. Mg. 28 (1864) 311-; 29 (1865) 215-.
- in human body. *Atwater, W. O., & Rosa, E. B.* B. A. Rp. (1897) 583; (1898) 778.
- illustration. *Trowbridge, J.* [1879] Am. Ac. P. 15 (1880) 235.
- and increase of entropy. *Gosiewski, W.* Prace Mt.-Fiz. 10 (1899-1900) 25-.
- jubilee of Helmholtz's essay. *Warburg, E.* Berl. Ps. Gs. Vh. (1897) 151-.
- in organic nature. *Helmholtz, H.* [1861] R. I. P. 3 (1858-62) 347-.
- and transformation. *Atkins, (Rev.) E.* (xii) Leic. S. T. (1881-82) 32-.
- Energy. *Gin, G.* Z. Angew. C. (1899) 657-.
- , chemical and electric, relation. *Farkas, G.* Orv.-Termt. Éts. (Termt. Szak) (1888) 33-; Z. Ps. C. 2 (1888) 148-.
- "content" in chemistry and physics. *Meyerhoffer, W.* Z. Ps. C. 7 (1891) 544-.
- — — — — (Meyerhoffer). *Wald, F.* Z. Ps. C. 8 (1891) 272-.
- distribution, law. *Burbury, S. H.* Ph. Mg. 37 (1894) 143-.

- Energy, history. *Tait, P. G.* [1864] Ph. Mg. 29 (1865) 55-.
- , identity. *Lodge, O.* Nt. 47 (1892-98) 293.
- , sources. *Whitmill, C. T.* Card. Nt. S. T. 16 (1885) 58-.
- , storage. *Ayrton, W. E.* Nt. 25 (1882) 495-.
- , theory, present position. *Wien, W.* D. Nf. Vh. (1890) (Th. 2) 45-.
- , transformation. *Peddie, W.* Edinb. R. S. P. 19 (1893) 353-.
- , — into muscular work. *Richet, C.* Rv. Sc. 41 (1888) 561-.
- Experimental properties of different energies. *Vaschy, A.* Éclair. Élect. 13 (1897) 5-.
- First law. *Tiurin, V. A.* Rs. Ps.-C. S. J. 25 (Ps.) (1893) 112-.
- , —. *Łopuszanski, T.* Wlad. Mt. 3 (1899) 42-; Fsch. Ps. (1898) (Ab. 2) 195-.
- , —, lecture apparatus. *Bartoli, A.* N. Cim. 15 (1884) 18-.
- Force, changes and unity. *Pérard, L.* Cuyper Rv. Un. 21 (1867) 219-.
- Forces, correlation. *Secchi, A.* G. Arcad. 9 (1858) 3-.
- , —, vital agency with reference to. *Seller, W.* [1864] Edinb. R. S. P. 5 (1866) 209-.
- , transformation. *Crova, A.* J. de Ps. 4 (1875) 357-.
- Heat, abstraction by mechanical energy. *Rowbotham, J.* [1882] Franklin I. J. 85 (1883) 95-.
- , chemical and electrical actions, relations. *Busoni, D.* Ven. Aten. 2 (1865) 531-.
- , conduction and work. *Kohlrausch, F.* Gött. Nr. (1874) 82-.
- , conversion into mechanical effect. *Siemens, C. W.* CE. I. P. 12 (1852-53) 571-.
- , — — energy. *Popov, A. S.* Rs. Ps.-C. S. J. 26 (Ps.) (1894) 331-; J. de Ps. 4 (1895) 587-.
- , — — work and electricity. *Leblanc, M.* Lum. Élect. 3 (\*1881) 199-, 218-, 230-.
- , — — at normal temperature. *Aitken, J.* (of Darroch). Nt. 17 (1878) 260.
- , — and electricity, conversion of mechanical energy into. *Eccher, A. de.* (ix) N. Cim. 5 & 6 (1871) 99-.
- , — generated by subsidence of ground. *Haton de la Goupillière, J. N.* A. Mines 17 (1880) 322-.
- , — solar, conversion into mechanical energy, new mode. *Merget, A.* [1873] (x) Lyon S. Ag. A. 6 (1874) 849-.
- , —, utilisation. *Claussen, —.* [1897] Lüneb. Nt. Vr. Jh. 14 (1898) xxxix-.
- , —, theory. *Heintz, W.* Halle Z. Nw. 1 (1853) 417-.
- , —. *Harrison, A. A.* [1856] (vii) Camb. Ph. S. P. 1 (1866) 169-.
- , —. *Hirn, G. A.* Les Mondes 4 (1864) 353-.
- , —, new. *Joule, J. P.* Manch. Ph. S. Mm. 7 (1846) 111-.
- , —, — theorem. *Kirchhoff, G.* Heidl. Vh. Nt. Md. (1859-60) 16-.
- Heat vibrations, nature. *Croll, J.* Ph. Mg. 27 (1864) 346-.
- Mechanical antecedents of motion, heat and light. *Thomson, (Sir) W.* B. A. Rp. (1854) (pt. 2) 59-; C. R. 40 (1855) 1197-.
- , — energy, restoration from unequally heated space. *Thomson, (Sir) W.* Ph. Mg. 5 (1853) 102-.
- , — equivalent, gravitation force and expansive force. *Rhodes, J.* [1883] Manch. Lt. Ph. S. P. 23 (\*1884) 4.
- , — power, conversion into heat. *Van-Buren, J. D.* Franklin I. J. 51 (1866) 323-.
- , — work and its transformations. *Dupré, A.* C. R. 50 (1860) 588-; 52 (1861) 1185-; 54 (1862) 907-; A. C. 1 (1864) 175-.
- Motion, conversion into heat. *Mohr, C. F.* Bonn SB. Niedr. Gs. (1870) 59-.
- , — — in rotating bodies. *Riatti, V.* Mil. I. Lomb. Rd. 1 (1868) 578-.
- , — — — (Riatti). *Cantoni, G.* Mil. I. Lomb. Rd. 1 (1868) 586-.
- Motive power, origin and transformations. *Thomson, (Sir) W.* [1856] B. I. P. 2 (1854-58) 199-.
- Pneumatic tube, despatch, wastefulness. *Moon, W.* Tel. J. 18 (1886) 180-.
- Shooting stars, cause of incandescence. *Riatti, V.* Mil. I. Lomb. Rd. 2 (1869) 48-.
- Thermodynamics of gases, laws of Joule and Mariotte and Gay-Lussac. *Andrade, J.* C. R. 118 (1894) 64-, 220.
- , — — — — in real gases. *Andrade, J.* C. R. 118 (1894) 244-.
- , —, principles. *Heath, J. M.* Ph. Mg. 40 (1870) 218-, 429-.
- Transformations and equilibrium. *Gouy, —.* C. R. 108 (1889) 507-, 794.
- , — —. *Duhem, P.* C. R. 108 (1889) 666-.
- Vis viva, conversion into heat. *Bizio, B.* Cantù Cronaca 4 (1858) 601-, 668-.
- , — —. *Volpicelli, P.* Rm. At. R. Ac. 24 (1870-71) 136-; C. R. 73 (1871) 492-.
- , — — — and reciprocally. *Mayer, J. R.* C. R. 27 (1848) 385-.
- , — equation in thermodynamics, and relation of thermodynamics to classic mechanics. *Duhem, P.* [1897] Bordeaux S. Sc. PV. (1897-98) 28-.
- Work in animal economy, thermal relations. *Chauveau, A.* C. R. 123 (1899) 388-, 479-.
- , —, expression for an elementary transformation. *Moutier, J.* C. R. 80 (1875) 40-.

## 2410 Mechanical Equivalent of Heat.

- Joule, J. P.* [1845-49] B. A. Rp. (1845) (pt. 2) 31; Ph. Mg. 27 (1845) 205-; B. A. Rp. (1848) (pt. 2) 21-; C. R. 28 (1849) 132-; Phil. Trans. (1850) 61-.
- Kupffer, A. T.* [1851] St. Pét. Ac. Sc. Bil. 10 (1852) 193-.
- Mayer, J. R.* [1851] Ph. Mg. 25 (1863) 493-.
- Person, C. C.* C. R. 39 (1854) 1131-.

- Joule, J. P.* C. R. 40 (1855) 310-.
- Laboulaye, C.* L'I. 23 (1855) 160-.
- Baumgartner, A. von.* Wien Alm. (1857) 9-.
- Favre, P. A.* C. R. 46 (1858) 337-.
- Estocquois, T.* C. R. 46 (1858) 461-.
- Hirn, G. A.* Bb. Un. Arch. 6 (1859) 146-.
- Desprels, —.* C. R. 51 (1860) 496; L'I. 28 (1860) 358-.
- Belanger, J. B.* Par. Ing. Civ. Mm. (1862) 509-.
- Casa, L. della.* Bologna Mm. Ac. 1 (1862) 479-.
- Dupré, A.* Les Mondes 6 (1864) 315-.
- Laboulaye, C., & Tresca, H.* C. R. 58 (1864) 358-; Par. Mm. Sav. Étr. 18 (1868) 488-.
- Burdin, —.* C. R. 58 (1864) 885-.
- Kurz, A.* Z. Mth. Ps. 10 (1865) 428-.
- (Laboulaye and Tresca.) *Morin, A. J.* C. R. 60 (1865) 326-.
- Pazienti, A.* Ven. Mm. I. 12 (1864) 173-; 13 (1866) 507-.
- Brasack, F.* Halle Z. Nw. 30 (1867) 418-.
- Mayr, J. R. von.* D. Nf. Tbl. (\*1869) 40-.
- Violle, J. C.* C. R. 70 (1870) 1283-; A. C. 21 (1870) 64-; C. R. 71 (1870) 270-.
- Carstädt, —.* Bresl. Jbr. Schl. Gs. 49 (1871) 32-.
- Provenzali, F. S.* Rm. At. N. Linc. 25 (1872) 420-.
- Violle, J.* Franklin I. J. 69 (1875) 357-.
- Pazienti, A.* Ven. I. Mm. 19 (1876) 111-.
- Mariotte, L. A.* Gén. Civ. 6 (1877) 276-, 348-, 484-, 543-.
- Donnini, P.* N. Cim. 5 (1879) 97-.
- Rowland, H. A.* [1879-80] Am. Ac. P. 15 (1880) 75-; 16 (1881) 88-.
- Haga, H.* [1881] Amst. Ak. Vs. M. 17 (1882) 211-; Arch. Néerl. 17 (1882) 261-.
- Cantoni, G., & Gerosa, G.* Rm. R. Ac. Linc. Mm. 12 (1882) 437-; N. Cim. 18 (\*1883) 60-.
- Schwartz, T.* Humb. 3 (1884) 380-.
- Kristensen, K. S.* Ts. Ps. C. 27 (1888) 321-.
- Wood, De V.* Railroad & Eng. J. 62 (1888) 55.
- Dwelschauvers-Dery, V.* Rv. Un. Mines 34 (1896) 141-; 36 (1896) 129-.
- Reynolds, O., & Moorby, W. H.* [1897] Phil. Trans. (A) 190 (1898) 301-.
- Animal motors and theory of heat. (Mechanical equivalents of animals on various rations.)  
*Lezé, R. A.* Agn. 16 (1890) 30-.
- Apparent discrepancy in certain gases.  
*Baumgartner, A. von.* Wien SB. 38 (1859) 379-.
- Application to calendars. *Krieg, O.* (viii) *Cuyper* Rv. Un. 8 (1860) 115-.
- Artillery, application of mechanical theory.  
*Brettes, M. de.* [Martin de Brettes, —.] Les Mondes 3 (1863) 717-.
- and steam engines, comparison of dynamic efficiency. *Martin de Brettes, —.* C. R. 58 (1864) 465-.
- Atomic heats, calculation on mechanical theory. *Sandrucci, A.* Rv. Sc.-Ind. 18 (1886) 129-.
- Balloon problem; expanding gas. *Paradox.* [Pseud.] Science 19 (1892) 136-.
- Comparison of values. *Chase, P. E.* [1870] Am. Ph. S. P. 11 (1871) 313.
- Comparison of values. *Casalunga, —.* As. Fr. C. R. (1900) (Pt. 1) 140-.
- Cooling of gases on expansion. *Hazen, H. A.* Science 19 (1892) 106.
- X. Science 19 (1892) 135-.

DETERMINATION OF MECHANICAL EQUIVALENT.

- Laboulaye, C.* C. R. 46 (1858) 773-.
- Weisbach, J.* Civing. 5 (1859) 46-.
- Dahlander, G. R.* [1864] Stockh. Öfv. 21 (1865) 169-; A. C. 4 (1865) 474-.
- Richter, V. von.* (xii) Rs. C. S. J. 3 (1871) 309-.
- Serrano y Fatigati, H.* Arch. Sc. Ps. Nt. 48 (1873) 252-.
- Puluj, J.* [1875] Wien Ak. Sb. 71 (1875) (Ab. 2) 677-; 72 (1876) (Ab. 2) 53-.
- (First report.) *Brit. Ass. Comm. B. A. Rp.* (1876) 275.
- Joule, J. P.* [1878] Phil. Trans. 169 (1879) 365-.
- Waltenhofen, A. von.* [1879] Wien Ak. Sb. 80 (1880) (Ab. 2) 137-.
- Bartoli, A.* Rm. R. Ac. Linc. Mm. 8 (1880) 67-.
- Fletcher, L. B.* [1881] (xii) J. H. Un. Cir. [1] (1882) 128.
- Dieterici, C.* D. Nf. Tbl. (1887) 236-; A. Ps. C. 33 (1888) 417-.
- Perot, A.* A. C. 13 (1888) 145-.
- Arsonval, — d'.* Par. S. Ps. Sé. (1891) 51-.
- Deprez, M.* C. R. 112 (1891) 1403-.
- Slotte, K. F.* Helsingf. Öfv. 33 (1891) 162-.
- Christiansen, C.* A. Ps. C. 48 (1893) 374-.
- Griffiths, E. H.* Nt. 47 (1892-93) 537; Phil. Trans. (A) 184 (1894) 361-; R. S. P. 55 (1894) 23-.
- Ayrton, W. E., & Haycraft, H. C.* [1894] L. Ps. S. P. 13 (1895) 295-; Ph. Mg. 39 (1895) 160-.
- Weber, L.* D. Nf. Vh. (1895) (Th. 2, Hälfte 1) 38-.
- Pernet, J.* Zür. Vjschr. 41 (1896) (Festschr., Th. 2) 121-.
- Perot, A.* A. C. 7 (1896) 574.
- Baille, J. B., & Féry, C.* C. R. 126 (1898) 1494-.
- (Recalculation of Griffiths's value.) *Wolff, F. A. (jun.)* J. H. Un. Cir. [17 (1897-98)] 54-.
- Casalunga, —.* As. Fr. C. R. (1899) (Pt. 1) 225-.
- Barnes, H. T.* [1900] R. S. P. 67 (1901) 238-.
- by dropping mercury. *Bartoli, —.* Catania Ac. Gioen. Bil. 26-28 (1892) 10.
- electrical method. *Quintus-Icilius, G. von.* C. R. 45 (1857) 420-.
- *Bosscha, J.* Amst. Vs. Ak. 9 (1859) 59-; Pogg. A. 108 (1859) 162-.
- *Joule, J. P.* B. A. Rp. 37 (1867) 512-.
- *Webster, A. G.* Am. Ac. P. 20 (1885) 490-.

- electrical method. *Arsonval*, — *d'*. *Elect.* 27 (1891) 588-.
- — — *Blondin*, *J.* *Lum. Élect.* 49 (1898) 201-.
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- Casalonga, D. A.* As. Fr. C. R. (1898) (Pt. 1) 114.
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- — — *Müller, J. J.* A. Ps. C. 152 (1874) 105-.
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- — — — (Maxwell's demons). [1900] *Lippmann, G.* Sc. Abs. 4 (1901) 381.
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- — — *FitzGerald, G. F.* Science 3 (1884) 88, 586; Dubl. S. Sc. P. 4 (1885) 57-.
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*Tschermak, G.* [1861] Wien Schr. Vr. Nw. Kennt. 2 (1861-62) 25-.

*Betocchi, A.* Rm. At. N. Linc. 21 (1868) 287-.

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*Hirsch, J. A.* Cons. Arts et Mét. 2 (1890) 336-.

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*Dowson, J. E.* I. Mn. E. T. 15 (1898) 326-.

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—, *Marchis, L. C. R.* 130 (1900) 705-, 1246-.

—, cooling. *Grouvelle, —, & Arquembourg, —.* [1900] Sc. Abs. 1 (1901) 534-.

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- Brande, W. T.* *QJ. Sc.* 1 (1816) 71-.
- (*Accum's treatise.*) *Biot, J. B.* *J. Sav.* (1817) 12-.
- Prechtel, J. J.* [1817] *Gilbert A.* 58 (1818) 111-.
- Clément, —.* *J. de Ps.* 90 (1820) 150-.
- Jarman, T.* *Silliman J.* 8 (1821) 170-.
- Biondelli, B.* *Poligrafo* 15 (1833) 97-, 226-.
- Jacquemyns, J.* *Quetelet Cor. Mth.* 9 (1837) 118-.
- Peebles, D. B.* [1879] *Sc. S. Arts T.* 10 (1883) 303-.
- Siemens, (Sir) C. W.* *Nt.* 24 (1881) 153-.

- acetylene. *Blochmann, R.* Königsb. Schr. 38 (1897) 26-.
- and calcium carbide. *Erdmann, H. Z.* Nw. 68 (1895) 257-; 72 (1899) 87-.
- electric arc, comparison. *Wedding, W.* Elect. 35 (1895) 777-.
- burners for. *Robison, (Sir) J.* [1839] Edinb. T. Sc. S. Arts 1 (1841) 438-.
- , *Audouin, P., & Bérard, P.* A. C. 65 (1862) 423-.
- , testing. *Rückisen, P., & Büchner, P. T.* Dingler 136 (1855) 369-.
- in factories. *Cohn, F.* Bresl. Schl. Gs. Übs. (1852) 180-.
- with hydrogen and carburetted hydrogen. *Bromeis, T.* Dingler 154 (1859) 83-.
- improvement. *Hudson, W. B.* QJ. Sc. 10 (1821) 464-.
- incandescent, Welsbach system. *Granger, A. O.* Franklin I. J. 125 (1888) 379-.
- invention. *Morren, C. F. A.* Brux. Ac. Bll. 2 (1835) 162-.
- of lighthouses, improved forms of lamps. *Wigham, J. R.* [1891] Dubl. S. Sc. P. 7 (1891-92) 147-.
- in London. *Schweigger, J. S. C.* Schweigger J. 17 (1816) 376-.
- new method. *Mansfield, C. B.* (vi *Adds.*) CE. I. P. 8 (1849) 207-.
- relation between volume consumed and light produced. *Stimpson, F. E.* Am. As. P. 19 (1870) 118-.
- of streets. *Accum, F.* Thomson A. Ph. 6 (1815) 16-.
- , *Millington, J.* QJ. Sc. 5 (1818) 177-.
- , Narbonne. *Pavesi, A.* Polli A. 26 (1858) 178-.
- , thermo-lamp for. *Lampadius, W. A.* Schweigger J. 8 (1813) 88-.
- in works at Freiberg. *Lampadius, W. A.* Erdm. J. Tech. C. 4 (1829) 123-.
- incandescent. *Denayrouze, L.* Rv. Sc. 11 (1899) 769-.
- indoors, by daylight, mathematical determination. *Mehmke, R.* Z. Mth. Ps. 43 (1898) 41-.
- intensity. *Zilov, P.* Rs. Ps.-C. S. J. 16 (Ps.) (1884) 168-; Fsch. Ps. (1884) (Ab. 2) 43-.
- , determination, graphical method. *Hoest, L.* [1898] Sc. Abs. 2 (1899) 345-.
- , geometrical construction for finding. *Lees, C. H.* Ph. Mg. 40 (1895) 463-.
- by lamps and candles, cost. *Ure, Andr.* Dingler 74 (1839) 202-.
- and light. *Gundlach, E.* (xii) Am. S. Mor. P. (1882) 79-.
- light obstruction, measurement. *Greenleaf, J. L.* [1885] Sch. Mines Q. N. Y. 7 (1886) 35-.
- by lime light, apparatus. *Drummond, T.* Edinb. J. Sc. 5 (1826) 819-.
- , — (Drummond). *Schweigger, J. S. C.* Schweigger J. 48 (=Jb. 18) (1826) 431-.
- , application to public and private lighting. *Gaudin, A.* C. R. 6 (1838) 861-.
- , of lighthouses in Black Sea. *Barlow, W. H.* Ph. Mg. 8 (1836) 238-.

- lime as means of. *Forni, G.* Cattaneo Bb. Farm. 6 (1836) 352-.
- lines of equal illumination. *Bordoni, A.* Brugnattelli G. 6 (1823) 196-, 259-.
- , —, *Schlömilch, O.* Schlömilch Z. 3 (1858) 321-.
- , —, *Basala, J.* Arch. Mth. Ps. 5 (1887) 113-.
- , —, *Waelach, E.* Wien Ak. Sb. 101 (1892) (Ab. 2a) 79-.
- , —, on algebraic ruled surface. *Burali-Forti, C.* Palermo Cir. Mt. Rd. 4 (1890) 57-.
- liquid hydrocarbons for. *Mansfield, C. B.* (vi *Adds.*) CE. I. P. 8 (1849) 207-.
- maximum or minimum points. *Breton, P.* Les Mondes 6 (1864) 270-.
- , due to 1 or 2 point-sources. *Weinberg, J.* Mosc. Bll. S. Nt. 33 (pt. 2) (1865) 435-.
- measurement. *Mascart, —.* [1888] Tel. E. J. 17 (1889) 642.
- , *Preece, W. H.* Elect. 23 (1889) 478.
- , as distinct from photometry. *Nerville, — de.* Elect. 25 (1890) 402-.
- with mineral oils. *Booth, J. C., & Garrett, T. H.* Franklin I. J. 43 (1862) 373-.
- of mines. *Lemelle, T.* Brux. Mm. Cour. 8° 1 (1840) 387-.
- by petroleum. *Wehrle, A.* Wien Jb. Pol. I. 5 (1824) 1-.
- — phosphorescent sulphides. *Montigny, C.* Brux. Ac. Bll. 49 (1890) 320-.
- by mixture of alcohol and turpentin. *Lancellotti, F.* [1843] Nap. At. I. Inc. 7 (1847) 135-.
- new system for steam boats to prevent running foul. *Charpy, —.* Rv. Mar. et Col. 82 (1884) 126-.
- from non-spherical surfaces in different positions. *Krüß, H.* Catg. Opt. 8 (1887) 85-.
- phenomena. *Lallemand, A.* C. R. 77 (1878) 1216-.
- and photometry. *Epstein, J.* Frkf. a. M. Pa. Vr. Jbr. (1894-95) 37.
- of plane surface. *Guillaume, C. É.* Lum. Elect. 26 (1887) 101-.
- portable dioramas. *Tait, G.* Edinb. N. Ph. J. 38 (1845) 214-.
- problem of the 2 lights. *Parker, W. H.* Camb. (M.) Mth. M. 3 (1860) 84-.
- — —, *Godfray, H.* Camb. (M.) Mth. M. 3 (1860) 88-.
- with spirit, experiments. *Majocchi, G. A.* (vi *Adds.*) Majocchi A. Fis. C. 6 (1842) 815-.
- of streets, mathematical theory. *Köpcke, —.* Civing. 33 (1887) 69-.
- of surface of ellipse by 2 sources of light at foci, point of maximum illumination. *Quillet, —.* N. A. Mth. 4 (1845) 89-.
- — — ellipsoid by luminous point. *Kiel, A.* Arch. Mth. Ps. 67 (1882) 181-.
- surfaces of equal illumination. *Hoppe, R.* [1867] Ups. N. Acta S. Sc. 6 (1868) 4 pp.
- of theatres. *Ainger, Alf.* R. I. J. 2 (1831) 45-, 214.
- theory. *Ebert, H.* D. Nf. Tbl. (1889) 200.



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- Photographic study of sources of light. *Crova*, A. C. R. 116 (1893) 1343-.
- value of moonlight and starlight. *Abney*, W. de W. R. S. P. 59 (1896) 314-.
- Pigments, brightness, by oblique vision. *Whitman*, F. P. Science 9 (1899) 734-.
- Relation between brightness of an object and that of its image. *Emtage*, W. T. A. Ph. Mg. 41 (1896) 504-.
- Sky, unclouded, brightness; and illumination by sun, sky and reflection. *Wiener*, C. [1900] Ac. Nt. C. N. Acta 73 (1907) 1-.
- Surface brightness, photographic measurement. *Hartmann*, J. Z. Instk. 19 (1899) 97-.
- , Laplace's shadow-. *Wittstein*, A. Arch. Mth. Ps. 70 (1884) 239-, viii.
- Variations produced by deposit of moisture. *Mensbrugge*, — van der. Brux. S. Sc. A. 16 (1892) (Pt. 1) 20-.
- White light produced by means of ordinary artificial light. *Tait*, G. Edinb. N. Ph. J. 42 (1847) 172-.
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- Prevost*, P. Bb. Brit. 54 (1813) 203-.
- Colladon*, D. Lille Tr. (1825) 20-.
- Anon.* (vi 299) Cattaneo G. Farm. 18 (1833) 303-.
- Talbot*, W. H. F. Ph. Mg. 5 (1834) 321-.
- Arago*, D. F. J. Bb. Un. 59 (1845) 396-; C. R. 30 (1850) 305-, 365-, 425-, 617-.
- Zöllner*, F. Pogg. A. 100 (1857) 381-, 474-, 651-; 109 (1860) 244-; Basel Vh. 2 (1860) 287-.
- Pohl*, J. J. Dingler 161 (1861) 450-.
- Wild*, H. Pogg. A. 118 (1863) 192-.
- Foster*, W. C. N. 24 (1871) 124-.
- Provenzani*, F. S. Rm. At. N. Linc. 24 (1871) 138-.
- Bohn*, C. [1872] Pogg. A. (Ergänz.) 6 (1874) 386-.
- Wolf*, C. J. de Ps. 1 (1872) 81-.
- Cornu*, A. Par. S. Ps. Sé. (1881) 50-; Lum. Elect. 5 (1881) 221-, 232-.
- Ketteler*, E., & *Pulfrich*, C. [1881] A. Ps. C. 15 (1882) 337-.
- Crova*, A. Rv. Sc. 3 (1882) 225-, 752-.
- Weber*, L. Cztg. Opt. 4 (\*1883) 181-, 194-.
- Möller*, W. Elekttech. Z. 5 (1884) 370-, 405-.
- (Möller.) *Weber*, L. Elekttech. Z. 6 (1885) 24-.
- Karsten*, G. [1886] Schl.-Holst. Nt. Vr. Schr. 7 (Heft 1) (1888) 29-.
- Mascart*, —. Par. S. Ps. Sé. (1886) 147-.
- Anon.* Z. C. In. 1 (1887) 217-, 246-.
- Lummer*, O., & *Brodhun*, E. Z. Instk. 9 (1889) 41-, 461-; 10 (1890) 119-; 12 (1892) 41-, 132-; 16 (1896) 299-.
- Lummer*, O. D. Nf. Vh. (1890) (Th. 2) 92-.
- Methven*, J. Cztg. Opt. 11 (1890) 134-.
- Thompson*, S. P. L. Ps. S. P. 12 (1894) 361-; Ph. Mg. 36 (1893) 120-.

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- analytical. *Bow*, R. H. [1865] Edinb. Sc. S. Arts T. 8 (1872) 28-.
- and geometrical methods. *Wesely*, J. Z. Mth. Ps. 16 (1871) 324-.
- , of luminous bodies. *Trannin*, H. C. R. 77 (1873) 1495-.
- apparatus (in Paris). *Krist*, J. Carl Rpm. 3 (1867) 18-.
- *Weber*, L. A. Ps. C. 20 (1883) 326-.
- application of coloured media, theory. *Krüss*, H. Cztg. Opt. 6 (1885) 196-, 244-.
- diverging lenses. *Voller*, C. A. [1882] Hamb. Nt. Vr. Ab. 7 (Ab. 2) (1883) 40-.
- Dove's prism. *Grosse*, W. Cztg. Opt. 8 (1887) 157-.
- irradiation. *Lissagaray*, H. Mon. Sc. 10 (1888) 299-.
- the potential. *Houllevigue*, L. J. de Ps. 10 (1891) 126-.
- ten-candle lamps. *Harcourt*, A. V. B. A. Rp. (1894) 532-.
- of artificial means of illumination. *Porter*, C. H., & *Silliman*, B. Silliman J. 23 (1857) 315-.
- bright lights. *Hammerl*, H. (xiii) Elekttech. Z. 4 (1883) 262-.
- sources of colour. *Crova*, A. C. R. 99 (1884) 1067-.
- and brightness of solar disc. *Fontana*, G. Verona S. It. Mm. 1 (1782) 111-.
- of coloured flames. *Gouy*, A. C. R. 83 (1876) 269-; 85 (1877) 70-; A. C. 18 (1879) 5-; J. de Ps. 9 (1880) 19-.
- light. *Cavalleri*, G. M. Mil. G. I. Lomb. 9 (1856) 83-.
- *Vierordt*, K. A. Ps. C. 137 (1869) 200-.
- *Grönberg*, T. [1881] Riga Cor.-Bl. 25 (1882) 40-.
- *Whitman*, F. P. [1895] Ps. Rv. 3 (1896) 241-.
- rays, and measurement of chemical intensity of daylight and coloured lights. *Vogel*, H. W. Berl. Ps. Gs. Vh. (1891) 85-.
- sources of light. *Zahn*, W. von. [1874] Leip. Nf. Gs. Sb. 1 (1875) 25-.
- *Rood*, O. N. [1877] Am. J. Sc. 15 (1878) 81-.
- *Crova*, A. C. R. 93 (1881) 512-.
- *Nicati*, W., & *Macé de Lépinay*, J. As. Fr. C. R. (1882) 223-.
- *Macé de Lépinay*, J. C. R. 97 (1883) 1428-.
- *Weber*, L. Elekttech. Z. 5 (1884) 166-.
- colours. *Charpentier*, A. C. R. 88 (1879) 299-.
- (in the spectrum). *Abney*, (Capt.) W. de W., & *Festing*, (Maj.-Gen.) E. R. [1886] Phil. Trans. 177 (1887) 423-.
- (reflected). *Abney*, (Capt.) W. de W., & *Festing*, (Maj.-Gen.) E. R. [1888] Phil. Trans. (A) 179 (1889) 547-.
- *Abney*, (Capt.) W. de W. C. S. P. 7 (1891) 150-.

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- of colours. *Abney, (Capt.) W. de W., & Festing, (Maj.-Gen.) E. R.* Phil. Trans. (A) 183 (1893) 531-.
- — — *Lovibond, J. W.* Mcr. S. J. (1893) 275-.
- — — *Mayer, A. M.* Am. J. Sc. 46 (1893) 1-.
- by comparison, instrument. *Potter, R.* Ph. Mg. 1 (1892) 174-.
- in connection with physical optics. *Potter, R.* Ph. Mg. 16 (1840) 16-.
- correction of formula for absorption. *Bottomley, J.* [1881] Manch. Lt. Ph. S. Mm. (1884) 5-.
- of curved light-surfaces. *Salzmann, W.* Elekttech. Z. 8 (1887) 480-.
- diffuse reflection. *Lommel, E.* [1887] Münch. Ak. Sb. 17 (1888) 95-.
- — — *Seeliger, H.* [1888] Münch. Ak. Sb. 18 (1889) 201-.
- — — Lambert's law. *Seeliger, H.* Leip. As. Ga. Vjschr. 20 (1885) 267-.
- ELECTRIC LIGHT PHOTOMETRY.**
- Masson, A.* A. C. 14 (1845) 129-; C. R. 18 (1844) 289-; 19 (1844) 825-; A. C. 30 (1850) 5-; C. R. 30 (1850) 627-; 31 (1850) 887-; 32 (1851) 127-; A. C. 31 (1851) 295-; 45 (1855) 885-.
- Fizeau, H. L., & Foucault, L.* C. R. 18 (1844) 746-.
- Géraldy, F.* Lum. Élect. 1 (\*1879) 64-.
- Sabine, R.* B. A. Rp. (1882) 667-.
- Genung, N. H.* Elect. Rv. 31 (1892) 722-.
- arc, continuous current, as standard light. *Blondel, A.* [1893] Elect. 32 (1894) 117-, 145-, 169-.
- , enclosed alternating. *Mathews, C. P., Thompson, W. H., & Hilbish, J. E.* [1898] Sc. Abs. 2 (1899) 422.
- and glow lamps. *Voit, E., & Krüss, —.* Lum. Élect. 7 (\*1882) 402-.
- — — — *Krüss, H.* Elekttech. Z. 8 (1887) 356-.
- — — — (Krüss). *Heim, C.* Elekttech. Z. 8 (1887) 414.
- lamps. *Vogel, F.* Elekttech. Z. 8 (1887) 31.
- — — *Mathews, C. P.* Sc. Abs. 3 (1900) 928-.
- — — with various currents. *Lucas, F. C. R.* 100 (1885) 1454-.
- — — secondary standard. *Guilbert, F.* Lum. Élect. 47 (1893) 573-.
- candle power. *Higgs, R. W. H. P. I. CE. P.* 68 (1882) 117-.
- — — (mean horizontal). *Mathews, C. P.* Ps. Rv. 6 (1898) 55-.
- and gas light photometry, colour. *Meyer, O. E.* A. Ps. C. Beibl. 4 (1880) 130-.
- incandescent lamps. *Abney, (Capt.) W. de W., & Festing, (Maj.-Gen.) E. R.* R. S. P. 43 (1888) 247-.
- — — *Crova, A.* As. Fr. C. R. (1889) (Pt. 2) 836-.
- — — *Liebenthal, E.* Z. Instk. 19 (1899) 193-, 225-.
- — — *Rowland, A. J.* Franklin I. J. 148 (1899) 376-.

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- incandescent lamps and Auer's gas lamps. *Abt, A.* Orv.-Termt. Éts. (Termt. Szak) (1894) 294-, 347-.
- — — their efficiency. *Thomson, (Sir) W., & Bottomley, J. T.* B. A. Rp. (1881) 559-.
- — — electrical measurements. *Preace, W. H.* B. A. Rp. (1884) 654-.
- — — — — *Strecker, —.* Elekttech. Z. 8 (1887) 76-.
- — — hydrocarbon flames, colour. *Heise, R.* Berl. Gsndhamt. Arb. 17 (1900) 207-.
- — — stand for. *Sharp, C. H.* Ps. Bv. 11 (1900) 181-.
- — — technical photometry. *Strecker, —.* Elekttech. Z. 7 (1886) 146-.
- magneto-electric light. *Abney, (Capt.) W. de W.* R. S. P. 27 (1878) 157-.
- mode of obtaining uniform illumination. *Mallock, A.* Nt. 20 (1879) 314.
- petroleum as intermediate standard. *Krüss, H.* Cztg. Opt. 6 (1885) 195-.
- projectors. *Féry, C.* Lum. Élect. 50 (1893) 551-.
- very strong lights. *Erner, F.* Cztg. Opt. 7 (1886) 266-.
- — — — *Krüss, H.* Cztg. Opt. 8 (1887) 5-.
- tests. *Wagner, F. C.* Am. As. P. (1885) 161-.
- estimation of results. *Krüss, H.* [1888] Hamb. Mth. Gs. Mt. 1 (\*1889) 73-.
- of Fraunhofer's lines. *Vierordt, K. von.* A. Ps. C. 13 (1881) 339-.
- gradation-method. *Lehmann, A.* [1886] Kjøb. Dn. Vd. Selsk. Skr. 4 (1886-88) 233-.
- heterochromic. *Weber, L.* Cztg. Opt. 6 (1885) 245-.
- history. *Powell, B.* Thomson A. Ph. 11 (1826) 371-.
- *Boutan, A.* Rouen Tr. Ac. (1851-52) 101-.
- of illuminating globes. *Williamson, R. B., & Klünck, J. H.* Franklin I. J. 149 (1900) 66-.
- images in prism. *Grosse, W.* Cztg. Opt. 9 (1888) 61-.
- improvements. *Krüss, H.* [1884] Hamb. Mth. Gs. Mt. 1 (1889) 105-.
- of incandescent gas mantles. *Medley, E. A.* Elect. Rv. 41 (1897) 824-.
- investigations on absorption of light in isotropic and anisotropic media. *Pulfrich, C.* A. Ps. C. 14 (1881) 177-.
- of Geissler's tubes. *Simonsen, E. A.* Schl.-Holst. Nt. Vr. Schr. 8 (1891) 277-.
- — — tourmaline plates. *Schwebel, P. H.* (xii) Z. Kr. 7 (1883) 153-.
- laboratory at South Foreland. *Krüss, H.* Cztg. Opt. 7 (1886) 193-.
- and law of attraction. *Bezold, W. von.* A. Pa. C. 141 (1870) 91-.
- law, fundamental, application. *Krüss, H.* Cztg. Opt. 7 (1886) 218-.
- and luminosity. *Haycraft, J. B.* R. S. P. 61 (1897) 49-.
- measurement of absorption, method and apparatus. *Grosse, W.* C. Ztg. 12 (1888) 1553-.

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- measurement of duration and fluctuations in brightness. *Judin*, —. [1900] *Pliste. Rs.* 2 (1900-02) 70-.
- high temperatures. *Wanner*, *H.* *Ps.* Z. 1 (1900) 226-.
- with 2 normal flames, inaccuracy. *Coglievina*, *D.* *Z. C. In.* 1 (1887) 326-.
- method. *Müllendorff*, *A.* *Lux. Pb. I.* 12 (1872) 116-.
- *Orsoni*, *F.* *Rm. At. B. Ac.* 25 (1872) 482-.
- (Lalanne's). *Salanson*, *A.* *As. Fr. C. R.* (1880) 225-.
- *Charpentier*, *A.* (ix) *Nancy S. Sc. Bll.* 6 (16<sup>e</sup> Ann. 1883) (1884) xxvi-.
- *Henry*, *C.* *As. Fr. C. R.* (1895) (Pt. 1) 227-.
- of comparing surfaces. *Petrusevskij*, *T.* *Fachr. Ps.* (1894) (Ab. 2) 66-.
- for diffuse daylight. *Ure*, *Andr.* *B. A. Rp.* (1839) (pt. 2) 7-.
- methods. *Gaultis*, *R.* [1872] *Laus. Bll. S.* Vd. 11 (1873) 327-.
- *Blondel*, *A.* *C. R.* 120 (1895) 311-.
- *Broca*, *A.* *Éclair. Élect.* 6 (1896) 148-.
- observations. *Lampadius*, *W. A.* *Schweigger J.* 10 (1814) 124-; 11 (1814) 361-.
- *Schafhäutl*, *C. E.* *Münch. Gelehrte Az.* 17 (1843) 164-.
- during eclipse, Aug. 19, 1887. *Weber*, *L.* *Met. Z.* 5 (1888) 21-.
- of phosphorescent zinc sulphide. *Henry*, *C.* *C. R.* 115 (1892) 505-.
- photographic. *Crova*, *A.* *As. Fr. C. R.* (1892) (Pt. 1) 171.
- of the ultra-violet. *Simon*, *H. T.* *A. Ps.* C. 59 (1896) 91-.

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- Leslie*, *John*. *Nicholson J.* 3 (1800) 461-.
- Nicod-Delom*, *J. S.* *Bb. Un.* 1 (1816) 255-.
- Horner*, *J. K.* *Bb. Un.* 6 (1817) 162-.
- Landriani*, *M.* *Brugnatelli G.* 1 (1818) 413-.
- Ritchie*, *W.* [1824] *Phil. Trans.* (1825) 141-.
- Leslie*, *John*. *Edinb. N. Ph. J.* 4 (1828) 170-.
- Nicod-Delom*, *J. S.* *Bb. Un.* 55 (1834) 55-.
- Osann*, *G.* *Pogg. A.* 33 (1834) 405-.
- Babinet*, *J.* *B. A. Rp.* (1854) (pt. 2) 2.
- Bernard*, *F.* *B. A. Rp.* (1854) (pt. 2) 4-.
- Frisiani*, *P.* *Mil. Mm. I. Lomb.* 7 (1859) 389-.
- Dove*, *H. W.* *Berl. Mb.* (1861) 488-.
- Hirsch*, *A.* [1862] *Neuch. Bll.* 6 (1861-63) 94-.
- Rood*, *O. N.* (viii) *Am. J. Sc.* 36 (1863) 60-.
- Stevenson*, *T.* *Edinb. N. Ph. J.* 17 (1863) 208-.
- Bennington*, *C. H.* *Ph. Mg.* 34 (1867) 475-; 35 (1868) 78.
- Hagenbach*, *E.* *Sch. Gs. Vh.* 51 (1867) 66.
- Wesely*, *J.* *Z. Mth. Ps.* 16 (1871) 324-.
- Bruhns*, *C. C.* *Leip. As. Gs. Vjschr.* 10 (1875) 235-.
- Glan*, *P.* *A. Ps. C.* 1 (1877) 351-.
- Reynolds*, *O.* *Phil. Trans.* 166 (1877) 725-.
- Napoli*, *D.* *Par. S. Ps. S6.* (1890) 53-.
- Conroy*, (*Sir*) *J.* *Ph. Mg.* 15 (1883) 423-; *L. Ps. S. P.* 5 (1884) 253-.

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- Simonov*, *L. N.* *C. R.* 97 (1883) 1055-.
- König*, *A.* *Berl. Ps. Gs. Vh.* (1886) 9-.
- Grosse*, *W.* *Z. Instk.* 7 (1887) 129-; 8 (1888) 95-, 129-.
- Grashof*, —. [1889] *Karlsruhe Nt. Vr. Vh.* 11 (1896) (Sb.) 44-.
- Palaz*, *A.* *Lum. Élect.* 31 (1889) 220-; 35 (1890) 520-, 574-, 611-.
- Lehmann*, *E. W.* *A. Ps. C.* 49 (1893) 672-.
- Mesnard*, *E.* *Par. S. Ps. S6.* (1893) 172-.
- Trotter*, *A. P.* *L. Ps. S. P.* 12 (1894) 354-; *Ph. Mg.* 36 (1893) 82-.
- Murani*, *O.* *Mil. I. Lomb. Rd.* 27 (1894) 316-.
- Spurge*, *J. B.* *L. Ps. S. P.* 12 (1894) 522.
- Onimus*, —. *C. B.* 127 (1898) 663-.
- Martens*, *F. F.* *D. Ps. Gs. Vh.* (1899) 278-.
- accurate and universally applicable, requisites for. *Krecker*, *F. W. C.* *Rot. N. Vh.* 12 (1<sup>re</sup> Stuk) (1851) 5-.
- analysing. *Govi*, *G.* *C. R.* 50 (1860) 156-; *N. Cim.* 11 (1860) 39-.
- in astronomy. *Sachsen-Altenburg*, (*Prinz*) *Ernst von*. [1894] *Mt. Ostld.* 8 (1898) 15-.
- audible. *Giltay*, *J. W.* [1881] *Nt.* 25 (1882) 125.
- automatic, by revolutions of radiometer. *Olivier*, *L.* *C. R.* 106 (1888) 840-.
- bi-refringent prism. *Abria*, —. *Bordeaux Act.* (1843) 853-.
- on Bouguer's principles. *Ritchie*, *W.* *Edinb. R. S. T.* 10 (1826) 443-.

*Bunsen's Photometer.*

- Langberg*, *C.* *N. Mg. Ntvd.* 9 (1857) 97-.
- Bohn*, *C.* *Lieb. A.* 111 (1859) 335-.
- Hajech*, *C.* *Mil. I. Lomb. Rd.* 4 (1867) 77-.
- Rüdorff*, *F. A.* *Ps. C. Jubelbd.* (1874) 234-.
- Kriess*, *A. H.* *Hamb. Nt. Vr. Vh.* 5 (1881) 71-; *Hamb. Nt. Vr. Ab.* 8 (1884) No. 4, 8 pp.
- Palaz*, *A.* *Lum. Élect.* 31 (1889) 267-.
- Boulouch*, *R.* *C. B.* 111 (1890) 642-.
- accuracy for measurements of photographic density, and sector photometer. *Abney*, (*Capt.*) *W. de W.* *S. C. In. J.* 9 (1890) 722-.
- — — — — (Abney). *Hurter*, *F., & Driffield*, *V. C.* *S. C. In. J.* 9 (1890) 725.
- — — — — (Hurter & Driffield). *Abney*, (*Capt.*) *W. de W.* *S. C. In. J.* 10 (1891) 18-.
- — — — — (Abney). *Hurter*, *F., & Driffield*, *V. C.* *S. C. In. J.* 10 (1891) 20-, 98-.
- improvements. *Gezechus* [*Hesehus*], *N. A.* *Rs. Ps.-C. S. J.* 20 (*Ps.*) (1888) 107-; *J. de Ps.* 8 (1889) 539.
- *Nebel*, *B.* *Exner Bpm.* 24 (1888) 724-.
- modification. *Töppler*, *A. J. I.* *A. Ps. C.* 8 (1879) 640-.
- observation. *Erhard*, *T.* *Elekttech. Z.* 10 (1889) 877-.
- and sector photometer. *Hurter*, *F.* *S. C. In. J.* 10 (1891) 818.
- with 3 spots and inclined or rotating screen. *Gezechus* [*Hesehus*], *N. A.* *Rs. Ps.-C. S. J.* 24 (*Ps.*) (1892) 165-; *J. de Ps.* 2 (1893) 504-.



- theory. *Weber, L.* Bresl. Schl. Gs. Jbr. (1887) 108-.
- *Lewis, D. M.* Nt. 40 (1889) 174.
- and colorimeter. *Grosse, W.* D. Nf. Tbl. (1888) 6-.
- compensation-. *Krüß, H.* Cztg. Opt. 6 (1885) 219-.
- (*Krüß*). *Strecker, K.* Cztg. Opt. 8 (1887) 222-.
- *Grosse, W.* Elekttech. Z. 9 (1888) 151-.
- (*Krüß*), improved. *Lašinov, D.* Rs. Ps.-C. S. J. 20 (*Ps.*) (1888) 247-; *J. de Ps.* 8 (1889) 543-.
- complementary. *Brücke, E.* Z. Instk. 10 (1890) 11-.
- for control of gas-lighting. *Poppe, A.* (*vi Adds.*) Frkf. Jbr. Ps. Vr. (1857-58) 74-.
- cosine-, *Arnoux, Dieudonné, E.* Lum. Élect. 23 (1887) 555-.
- Decoudun, graduation. *Weber, L.* Bresl. Schl. Gs. Jbr. (1888) 28-.
- depending on phosphorescence of zinc sulphide. *Henry, C.* C. R. 128 (1899) 941-.
- differential. *Zenger, C. W.* [1870] Prag Ab. 4 (1871) 21 pp.
- for diffused light. *Weber, L.* Bresl. Schl. Gs. Jbr. (1884) 241-.
- — — *Simonoff, —.* Nt. 48 (1893) 12-.
- diffusion-. *Crova, A.* C. R. 99 (1884) 1115-; *A. C.* 6 (1885) 342-.
- *Joly, J.* Ph. Mg. 26 (1888) 26-.
- direct reading. *Varley, F. H.* B. A. Rp. (1890) 759-.
- dispersion-. *Perry, J., & Ayrton, W. E.* [1879] L. Ps. S. P. 3 (1880) 184-; *Ph. Mg.* 9 (1880) 117-.
- , simplified. *Perry, J., & Ayrton, W. E.* L. Ps. S. P. 5 (1884) 109-; *Ph. Mg.* 14 (1882) 45-.
- double image, method for dispensing with use of polarised light. *Cornu, A.* C. R. 103 (1886) 1227-.
- photometric telescope for polarised light. *Godard, L.* Par. S. Ps. Sé. (1886) 83-.
- electric. *Egorov, N. G.* (*xiii*) Rs. C. Ps. S. J. 9 (*Ps.*) (1877) [*Pt.* 1] 33-, 78-, 143-.
- for electric light. *Wybauw, —.* Dingler 258 (1885) 69-.
- electric microphotometer. *Machado, V.* Lisb. J. Sc. Mth. 7 (1880) 255-.
- "flicker." *Rood, O. N.* Am. J. Sc. 46 (1893) 178-.
- *Whitman, F. P.* [1895] Ps. Rv. 3 (1896) 241-.
- *Tufts, F. L.* [1897] N. Y. Ac. T. 16 (1898) 190-.
- *Rood, O. N.* Science 7 (1898) 757-.
- *Whitman, F. P.* Science 8 (1898) 11-.
- *Rood, O. N.* Am. J. Sc. 8 (1899) 194-; *Ps. Z.* 1 (1900) 269-.
- holophotometer, *Vernon Harcourt's.* Anon. Tel. J. 23 (1888) 39-.
- influence of length on results. *Krüß, H.* Cztg. Opt. 8 (1887) 28-.
- — — — *Coglievina, D.* Cztg. Opt. 8 (1887) 97-.
- interference-. *Fuchs, F.* A. Ps. C. 11 (1880) 465-.
- iodide of nitrogen. *Lion, —.* Nt. 42 (1890) 511.
- Leslie's.* *Ritchie, W.* Edinb. J. Sc. 2 (1825) 321-; 3 (1825) 104-.
- for light reflected by metallic surfaces. *Rood, O. N.* Am. J. Sc. 49 (1870) 145-.
- Lummer and Brodhun's* (replacement of grease spot). *Lummer, O., & Brodhun, E.* Z. Instk. 9 (1889) 23-.
- — — (*Swan's*). *Knott, C. G.* [1899] Edinb. R. S. P. 23 (1902) 12-.
- — — (*Knott*). *Lummer, O., & Brodhun, E.* Ph. Mg. 49 (1900) 541-.
- magnetic. *Coulon, R.* Lum. Élect. 5 (\*1881) 66-, 234-, 297-.
- Mascart's.* *Dieudonné, E.* Lum. Élect. 28 (1888) 114-.
- milk-glass, new mounting. *Weber, L.* [1890] Schl.-Holst. Nt. Vr. Schr. 8 (1891) 187-.
- mirrors, loss of light. *Uppenborn, F.* Elekttech. Z. 11 (1890) 138-.
- mixture-. *Krüß, H.* Z. Instk. 8 (1888) 347-.
- Nicod-Delom's.* *Raymond, G. M.* Bb. Un. 2 (1816) 240-.
- and optical chamber for demonstration. *Kolbe, B.* Z. Instk. 7 (1887) 77-.
- orthophote. *Brown, J. T.* B. A. Rp. (1890) 778.
- paper-, *Ritchie's.* *Bow, R. H.* [1865] Edinb. Sc. S. Arts T. 8 (1872) 28-.
- for photographers. *Dumont, —.* Nancy S. Sc. Bll. (1865) xvii.
- and photometry. *Palaz, A.* Lum. Élect. 35 (1890) 416-.
- polarimeter. *Wild, H.* Pogg. A. 99 (1856) 235-; *Bern Mt.* (1859) 24-; *Sch. Gs. Vh.* 46 (1862) 107-.
- polarisation-, achromatisation. *Czapski, S. Z.* Instk. 12 (1892) 161-.
- , for measuring contrast-intensity of Röntgen rays. *Boas, H.* D. Ps. Gs. Vh. (1899) 242-.
- , — technical purposes, examination of Wenham gas lamps. *Wild, H.* [1887] St. Pet. Ac. Sc. Mm. (*Rs.*) 63 (1890) (*App. No.* 1) 31 pp.; *St. Pét. Ac. Sc. Bll.* 32 (1888) 193-.
- , — — —, simplification. *Wild, H.* [1888] St. Pét. Ac. Sc. Bll. 33 (1890) 5-.
- , — white light. *Martens, F. F.* D. Ps. Gs. Vh. (1899) 204-; *Ps. Z.* 1 (1900) 299-.
- portable. *Salomons, (Sir) D.* [1893] I. Elect. E. J. 22 (1894) 197-.
- , improved. *Preece, W. H., & Trotter, A. P.* Elect. 35 (1895) 671-.
- Potter's.* *Poggendorff, J. C.* Pogg. A. 29 (1833) 484-.
- Preece and Trotter's.* Anon. Cztg. Opt. 19 (1898) 236.
- pupil-. *Gorham, J.* R. S. P. 37 (1884) 425-.
- for purposes of school hygiene. *Petrusevskij, T.* Rs. Ps.-C. S. J. 16 (*Ps.*) (1884) 295-, 565-; *Fachr. Ps.* (1884) (*Ab.* 2) 120-.
- radial, and the proposed standards of light. *Dibdin, W. J.* S. C. In. J. 3 (1884) 277-; 4 (1885) 250-.
- reflecting. *Kurz, A.* Sch. Pol. Z. 6 (1861) 66-.

## 3010 Photometers

registering, for measuring light in lake and ocean depths. *Regnard*, —. Par. S. Bl. Mm. 40 (1888) (C. R.) 626-.

“relief-.” *Yvon*, P. C. R. 75 (1872) 1102-; J. Phm. 28 (1878) 102-.

sector-. *Ferry*, E. S. Am. As. P. (1898) 77; Ps. Rv. 1 (1894) 338-.

selenium-. *Boistel*, E. Lum. Élect. 7 (\*1882) 38-, 120.

settings, device for recording. *Matthews*, C. P. Ps. Rv. 7 (1898) 239-.

Simonov's. *Nansouty*, M. de. Gén. Civ. 6 (1884-85) 266-.

sine-, *Hawker's*. *Hawker*, T. H. S. Elect. 13 (1884) 253-.

and solar light. *Ponton*, M. [1856] Edinb. R. S. T. 21 (1857) 363-.

of solid paraffin or other translucent substance. *Joly*, J. [1894] Dubl. S. Sc. P. 4 (1885) 345-.

tangent-. *Bothe*, F. A. Ps. C. 128 (1866) 628-.

universal. *Schafhäutl*, C. E. CE. I. P. 1 (1841) 101-; Münch. Ab. 7 (1855) 465-.

Weber's. *Redwood*, B. S. C. In. J. 4 (1885) 446-.

— *Schlenk*, C. Cztg. Opt. 8 (1887) 207-.

— *Frisch*, G. Cztg. Opt. 10 (1889) 241-, 253-, 265-.

wedge-. *Harrington*, M. W. Science 1 (\*1888) 450-.

— *Gothard*, E. von. Z. Instk. 7 (1887) 347-.

—, compound. *Spitta*, E. J. R. S. P. 47 (1890) 15-.

— and diaphragm-. *Sabine*, R. Ph. Mg. 15 (1883) 22-.

*Wild's*. *Möller*, W. A. Ps. C. 24 (1885) 446-.

and photometry. *Henry*, C. Lum. Élect. 47 (1893) 201-, 564-.

physiological method. *Nicati*, —. Par. S. Bl. Mm. 46 (1894) (C. R.) 301-.

practical. *Palaz*, A. Lum. Elect. 33 (1889) 407-.

— *Richards*, R. C. Tel. J. 28 (1891) 146-, 400-, 423-; 29 (1891) 269-, 298-, 331-, 355-, 389-, 416-, 445-.

—, by papers sensitive to light. *Crzellitzer*, A. Arch. Hyg. 88 (1900) 317-.

principle. *Talbot*, H. F. Ph. Mg. 5 (1884) 327-.

— (*Talbot*). *Plateau*, J. A. F. Brux. Ac. Bll. 2 (1835) 52-.

principles. *Krüss*, A. H. Hamb. Nt. Vr. Ab. 7 (Ab. 2) (1883) 25-.

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— *Coglievina*, D. Carl Rpm. 18 (1882) 340-.

—, solution. *Stuart*, L. C. Liouv. J. Mth. 13 (1848) 257-.

—, —. *Dianu*, F. N. Les Mondes 5 (1864) 632-.

problems. *Beer*, A. Pogg. A. 88 (1853) 114-.

and pupillometry. *Henry*, C. Lum. Elect. 52 (1894) 451-, 510-, 614-; Éclair. Élect. 1 (1894) 337-, 529-, 673-.

— the radiometer. *Droux*, L. A. Gén. Civ. 6 (1877) 359-.

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report to International Electricity Congress. *Violle*, J. Elect. 45 (1900) 858-.

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of simple radiations. *Crova*, A., & *Lagarde*, H. C. R. 93 (1881) 959-; J. de Ps. 1 (1882) 162-.

— sky light. *Wild*, H. I. [1875-77] St. Pét. Ac. Sc. Bll. 21 (1876) 312-; 23 (1877) 290-.

— different sources of light. *Baille*, J. B., & *Féry*, C. Lum. Elect. 41 (1891) 153-.

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comparison of artificial illuminants. *Nichols*, E. L., & *Franklin*, W. S. [1888] Am. J. Sc. 38 (1889) 100-.

— — Auer incandescent gas light with electric glow and arc lamps and sunlight. *Mützel*, K. Elekttech. Z. 15 (1894) 476-.

of electric light. *Gaud*, F. C. R. 129 (1899) 759-.

methods. *Arsonval*, A. d'. Par. S. Bl. Mm. 41 (1889) (C. R.) 352-.

physiological applications. *Lambling*, E. Arch. de Pl. 2 (1888) 1-, 384-.

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— — — — prismatic and diffraction-. *Draper*, J. W. Nt. 20 (1879) 301-.

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— *Zahn*, W. von. Leip. Nf. Gs. Sb. 5 (1878) 1-.

— *Fuchs*, F. (xii) Z. Instk. 1 (1881) 326-, 349-.

— *Crova*, A. [1883-84] (ix) Mntp. Ac. Mm. 10 (1884) 525-.

— *Glazebrook*, R. T. Camb. Ph. S. P. 4 (1883) 304-.

— *Wild*, H. I. St. Pét. Ac. Sc. Bll. 28 (1883) 392-.

— *König*, A. Berl. Ps. Gs. Vh. (1885) 50-; (1886) 49-.

— *Arsonval*, A. d'. Par. S. Bl. Mm. 40 (1888) (C. R.) 800-; 41 (1889) (C. R.) 351-.

— *Hüfner*, G. Z. Ps. C. 3 (1889) 562-.

— *Arsonval*, A. d'. Par. S. Ps. Sé. (1890) 109-.

— *König*, A. A. Ps. C. 53 (1894) 785-.

— *Nichols*, E. L. Ps. Rv. 2 (1895) 138-.

— *Martens*, F. F. Z. Angew. Mkr. 5 (1900) 338-.

— for detecting telluric lines in solar spectrum. *Melander*, G. Helsingf. Ötv. 39 (1897) 247-.

—, *König's*, new construction. *Martens*, F. F. D. Ps. Gs. Vh. (1899) 280-.

— with Lummer-Brodhun prism. *Krüss*, H. Z. Instk. 18 (1898) 12-.

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- spectrophotometer, new. *Lummer, O.* A. Ps. C. (Berl. Ps. Gs. Vh. 1892) 46 (1892) 337-.
- , and optical method of calibration. *Brace, D. B.* Ph. Mg. 48 (1899) 420-.
- , variation of constant. *Otto, J. G.* Christiania F. (1888) No. 3, 5 pp.
- spectrophotometers. *Crova, A.* J. de Ps. 8 (1879) 85-; C. R. 92 (1881) 36-.
- , improvements. *Zenker, W.* Z. Instk. 4 (1884) 83-.
- spectrum, photometric comparison of different parts. *Trannin, H.* Par. S. Ps. Sé. (1876) 107-.
- , —, —, —, —. *Nicati, W., & Macé de Lépinay, J.* A. C. 24 (1881) 289-; 30 (1883) 145-; Par. S. Ps. Sé. (1883) 11-.
- suggested remedy for source of error. *Wright, L. T.* S. C. In. J. 15 (1896) 558.
- system proposed by Cesa-Bianchi. *Magrini, L.* Mil. G. I. Lomb. 8 (1856) 419-.
- theory. *Zöllner, F.* A. Ps. C. 128 (1866) 46-.
- and undulatory theory of light. *Wheeler, J. H.* Ph. Mg. 5 (1884) 439-.
- visual sensations, theory and experiments. *Broca, A.* Par. S. Ps. Sé. (1894) 81-.

- Photometer. *Henry, C.* Par. S. Bl. Mm. 44 (1892) (C. R.) 935-.
- Pyrometry and photometry with reference to actinometry. *Chistoni, C.* Mod. S. Nt. At. 1 (1900) 66-.
- Shadows, 2, produced by single luminous source. *Mascari, A.* Spet. It. Mm. 18 (1890) 106-.
- Smoke density, observation and measurement. *Hille, B.* Civing. 40 (1894) 327-.
- Sunlight colours. *Abney, (Capt.) W. de W.* [1887] R. I. P. 12 (1889) 61-.

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- Heeren, F.* Dingler 160 (1861) 267-.
- Schwendler, L.* Beng. As. S. J. 48 (1879) (Pt. 2) 83-.
- (Schwendler.) *Géraldy, F.* Lum. Élect. 2 (\*1880) 189-.
- Ridout, R. H.* [1880] Birm. Ph. S. P. 2 (1881) 160-.
- Géraldy, F.* Lum. Elect. 6 (\*1882) 280-.
- Krüß, H.* Cztg. Opt. 4 (\*1883) 161-, 169-.
- Preece, W. H.* [1883-84] R. S. P. 36 (\*1884) 270-; Lum. Elect. 12 (1884) 49-.
- Siemens, W.* Elekttech. Z. 5 (1884) 244-.
- Warren, T. T. P. B.* Elect. 13 (1884) 104-.
- Krüß, H.* Cztg. Opt. 6 (1885) 92-, 102-, 115-.
- Siemens, W.* [1885] Phot. J. 10 (1886) 39-.
- Trowbridge, J.* Am. Ac. P. 20 (1885) 494-.
- Violle, J.* Par. S. Ps. Sé. (1885) 64.
- Dibdin, W. J.* S. C. In. J. 7 (1888) 367-.
- Palaz, A.* Lum. Elect. 27 (1888) 151-, 216-, 406-, 458-, 618-; 31 (1889) 109-.
- Bunte, —.* [1889] Karlsruhe Nt. Vr. Vh. 11 (1896) (Sb.) 53-.

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- Blondel, A.* Lum. Élect. 53 (1894) 7-, 100; Éclair. Élect. 8 (1896) 341-.
- Krüß, H.* S. C. In. J. 15 (1896) 580.
- Sharp, C. H.* Science 4 (1896) 347.
- Weber, L.* Elekttech. Z. 18 (1897) 91-.
- Féry, C.* C. R. 126 (1898) 1192-.
- Grafton, W.* S. C. In. J. 17 (1898) 831.
- Guillaume, C. É.* [1900] Sc. Abs. 4 (1901) 475-.
- Absolute unit. *Violle, J.* Par. S. Ps. Sé. (1884) 141-; Lum. Élect. 14 (1884) 475-, 514-.
- Acetylene light, measurement. *Erdmann, —.* Z. Angew. C. (1899) 1178.
- photometric standard. *Violle, J.* C. R. 122 (1896) 79-.
- — —. *Préaubert, E.* Angers S. Sc. Bll. (1900) 89-.
- Amyl acetate lamp. *Hefner-Alteneck, F. von.* S. C. In. J. 7 (1888) 202.
- — —. *Anon.* Cztg. Opt. 9 (1888) 109-.
- — —. *Bothamley, C. H.* Phot. J. 18 (1894) 281-.
- — — (Hefner-Alteneck), and absolute unit of light. *Reis, —.* Humb. 7 (1888) 183-.
- — — (—), constancy. *Anon.* Z. Instk. 13 (1893) 257-.
- — — (—), flame-gauge. *Martens, F. F.* D. Ps. Gs. Vh. (1900) 108-.
- — —, luminosity. *Liebenthal, E.* Elekttech. Z. 9 (1888) 478-.
- — — (Hefner-Alteneck) and pentane lamp, influence of composition of surrounding air. *Liebenthal, E.* Z. Instk. 15 (1895) 157-.
- — —, photometry with. *Voller, A.* Elekttech. Z. 12 (1891) 122-, 193-.
- — — (—) (Voller). *Hefner-Alteneck, F. von.* Elekttech. Z. 12 (1891) 177-, 194-.
- Bolometric measurements. *Lummer, O., & Kurlbaum, F.* Berl. Ak. Sb. (1894) 229-.
- — —. *Sharp, C. H., & Turnbull, W. R.* Ps. Rv. 2 (1895) 1-.
- Carcel lamp and spermaceti candle. *Vladimirskii, A. S.* [1871] (xii) Mosc. S. Sc. Bll. 89 [No. 2] (1880) 35-.
- Constant units. *Uppenborn, F.* Cztg. Opt. 9 (1888) 121-, 135-.
- Construction of unit. *Siemens, W.* Berl. Ak. Sb. (1884) 601-.
- Experiments. *Petavel, J. E.* R. S. P. 65 (1900) 469-.
- Hefner-Alteneck unit. *Hefner-Alteneck, F. von.* Elekttech. Z. 5 (1884) 20-.
- — —, new standard-lamp reproducing. *Blondel, A.* As. Fr. C. R. (1898) (Pt. 2) 223-.
- — —, photometric investigations. *Liebenthal, E.* Elekttech. Z. 9 (1888) 96-.
- Method of determination. *Pickering, W. H.* Science 6 (1885) 183.
- Methven standard with blackened chimney. *Fessenden, R. A.* Sc. Abs. 2 (1899) 508.
- Pentane 10-candle lamp as standard of light. *Harcourt, A. G. V.* B. A. Rp. (1898) 845-.
- standard, comparison of Harcourt's and Methven's photometric standards. *Rawson, W. S.* Elect. 17 (1886) 479-.

Pentane standard lamp giving a constant light.

*Harcourt, A. G. V.* B. A. Rp. (1883) 426-  
— — —, *Harcourt's Anon.* Tel. J. 22 (1888)  
358-.

— — —, light unit. *Harcourt, A. G. V.* C. N.  
36 (1877) 103-; B. A. Rp. (1887) 617-.

— — —, photometry. *Harcourt, A. G. V.* B. A.  
Rp. (1885) 916-.

Phosphorescence of zinc sulphide. *Henry, C.*  
C. B. 115 (1892) 602-.

Standard candle. *Anon.* (VI 868) *Nicholson J.*  
6 (1893) 219-.

— — —, radiation. *Hutchins, C. C.* Am. J. Sc.  
39 (1890) 392-.

— — —, sperm. *Young, W. C.* S. C. In. J. 10  
(1891) 185-.

— — —, use in photometry. *Sharp, C. H.* Ps.  
Rv. 3 (1896) 458-.

Swinburne-Thompson unit. *Thompson, S. P.*  
Elect. 31 (1893) 592.

Unit for photometric purposes. *Nippoldt, W. A.*  
Z. Nw. 11 (1875) 417-.

Units of light and brightness. *Weber, L.* Elect.  
25 (1890) 404.

— — —, electric light measurements.  
*Hefner-Alteneck, F. von.* (XII) *Elekttech. Z.*  
4 (1883) 445-.

— — —, magnetic and photometric. *Hanappe, S.*  
Rv. Un. Mines 36 (1896) 245-.

— — —, and photometric quantities. *Weber, L.*  
Bresl. Schl. Gs. Jbr. (1889) 110-.

— — —, photometry. *Rothén, —.* J. Tél. 9  
(1885) 125-.

Use of coal-gas. *Branly, E.* C. R. 104 (1887)  
847-.

— — —, rapidly moving sensitive surfaces in  
measurement of solar light. *Abney, (Capt.)*  
*W. de W.* Phot. J. 17 (1893) 235-.

Violle standard. *Cross, C. R.* Am. Ac. P. 22  
(1887) 220-.

— — —, *Palaz, A.* Lum. Élect. 34 (1889) 51-.

— — —, comparison with Carcel lamp. *Violle, J.*  
A. C. 3 (1884) 373-; C. R. 98 (1884) 1032-;  
Rv. Sc. 34 (1884) 146-.

— — —, platinum unit of the Phys.-Techn.  
Reichsanstalt. *Kurlbaum, F., & Lummer, O.*  
Berl. Ps. Gs. Vh. (1895) 56-.

— — —, Siemens's platinum normal lamp, experi-  
ments. *Liebenthal, E.* *Elekttech. Z.* 9 (1888)  
445-.

White light, committee on standards. *Brit.*  
*Ass. Comm. (Forbes, G.)* B. A. Rp. (1885)  
61-; (1888) 39-.

### 3020 Reflection and Refraction. Refractometers. (See also 3800; Chemistry 7310.) Refractive Indices.

Asterism, artificial production. *Grüel, C. A.*  
Pogg. A. 120 (1863) 511.

Aureole round head of shadow thrown on  
water. *Préaubert, E.* Angers S. Sc. Bl. 13  
(1884) 99-.

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Catoptrics. *Münchow, K. D. von.* Ac. Cæs.  
Leop. N. Acta 14 (1828) 619-.

— — —, theorem. *Dieu, T. N. A.* Mth. 9 (1850)  
409-.

— — —, true. *Werneburg, J. F. C.* Ac. Cæs. Leop.  
N. Acta 14 (1828) 573-.

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— — —, expression of fundamental proposition.  
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- — — —. *Buzzolini, G.* (xii) *Rv. Sc.-Ind.* 15 (1883) 302-.
- — — —, proof of conditions. *Banfi, E.* (xii) *Rv. Sc.-Ind.* 14 (1882) 214-.
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- , —. *Tychsen, C.* *Mth. Ts.* 3 (1861) 66-.
- , —. *Bauer, K. L.* *A. Ps. C.* 132 (1867) 658-; *Carl Rpm.* 3 (1867) 28-, 377-.
- , —. *Clark, P. M.* *Mess. Mth.* 4 (1868) 167-.
- , —. *Radau, R.* *Carl Rpm.* 4 (1868) 114-.
- , —. *Airy, O.* [1869] *Mess. Mth.* 5 (1871) 88-.
- , —. *Most, R.* *A. Ps. C.* 139 (1870) 505-; 141 (1870) 601-.
- , —. *Kurz, A.* *A. Ps. C.* 140 (1870) 658-.
- , —. *Fabian, O.* *Carl Rpm.* 9 (1873) 84-.
- , —. *Lommel, E. C. J.* *A. Ps. C.* 156 (1875) 578-.
- , —. *Berg, F. W.* *A. Ps. C.* 158 (1876) 651-.
- , —. *Lommel, E. C. J.* [1876] *Erlang. Ps. Md. S. Sb.* 9 (1877) 14-.
- , —. *Gezekhus [Hesekus], N. A.* (xii) *Rs. Ps.-C. S. J.* 12 (*Ps.*) (1880) [*Pt.* 1] 226-; (x) *A. Ps. C.* 6 (1882) 227-.
- , —. *Schellbach, C. H.* *A. Ps. C.* 14 (1881) 367.
- , —. *Kessler, F.* *A. Ps. C.* 15 (1882) 333-.
- , —. *Kraevich, K. D.* [1883] (xii) *Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 8-; *Fachr. Ps.* (\*1884) (*Ab. 2*) 43-.
- , —. *Zilov, P.* *Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 168-; *Fachr. Ps.* (1884) (*Ab. 2*) 43-.
- , — (Kraevich). *Volkov, M.* *Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 174.
- , —. *Rosenberg, V.* *Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 267-; *Fachr. Ps.* (1884) (*Ab. 2*) 42-.
- , — (Volkov). *Kraevich, K.* *Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 269-.
- , —. *Pilčikov, N.* *Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 539-; *Fachr. Ps.* (1884) (*Ab. 2*) 44-.
- , —. *Vanni, G.* *Rv. Sc.-Ind.* 16 (1884) 47-.
- , —. *Vliet, P. P. van der.* *Rs. Ps.-C. S. J.* 17 (*Ps.*) (1885) 399-.
- , —. *Lermantov, V. V.* *Rs. Ps.-C. S. J.* 18 (*Ps.*) (1886) 12-; *J. de Ps.* 4 (1885) 589-.
- , —. *Gruzincev, A. P.* *Kharkov Mth. S. Com.* (1887) 53-.
- , —. *Hess, W.* *A. Ps. C.* 36 (1889) 264-.
- , —. *Koppe, M.* *Cztg. Opt.* 11 (1890) 30-.
- , —. *Nipher, F. E.* [1895] *St. Louis Ac. T.* 7 (1894-97) 133-.
- , —, elementary proofs. *Kirkby, J. H.* *Nt.* 44 (1891) 294.
- , —, proof of symmetrical position. *Kahl, E.* *Z. Mth. Ps.* 12 (1867) 176-.
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- , apparatus to illustrate deviation. *Marcucci, S.* Rv. Sc.-Ind. 27 (1895) 101-.
- of beam of light. *Kurz, A.* Exner Rpm. 19 (1883) 557-.
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- of monochromatic light. *Almeida, C. A. M. de.* Lisb. J. Sc. Mth. 8 (1881) 80-.
- — — *Hepperger, J. von.* Wien Ak. Sb. 91 (1885) (Ab. 2) 640-.
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- Wollaston's reflecting, new property. *Bauernfeind, C. M. A.* Ps. C. 134 (1868) 169-.

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- Ditscheiner, L.* Wien Sb. 58 (1868) (Ab. 2) 561-.
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- — surfaces. *Abt, A.* Orv.-Termt. Éts. (Termt. Szak) (1885) 147-.
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- — — 2nd degree. *Plücker, J.* Crelle J. 35 (1847) 100-.
- — with negative curvature. *Smirnov, N. A.* Rs. Ps.-C. S. J. 32 (Ps.) (1900) 134-.
- — of water. *Piccard, J.* Arch. Sc. Ps. Nt. 21 (1889) 481-.
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- — —, change of images. *Dufour, C.* [1874] Laus. S. Vd. Bil. 13 (1874-75) 303-.
- — —, wave influence. *Soret, C.* Arch. Sc. Ps. Nt. 4 (1897) 530-; Sch. Nf. Gs. Vh. (1897) 58.
- symmetrical linear figures produced along river bank. *Storer, F. H.* Science 2 (\*1883) 36-.
- theory. *Pinto, L.* Nap. Ac. Pont. At. 28 (1898) No. 11, 24 pp.
- from thin cylinders tangential to a surface, and application to lighting of hair. *Delarive, L.* Arch. Sc. Ps. Nt. 57 (1876) 219-.
- total. *Maccullagh, J.* [1845] Ir. Ac. P. 3 (1845-47) 49-.
- *Jamin, J.* C. R. 31 (1850) 1-; Taylor Sc. Mm. 5 (1852) 66-.
- , experiment. *Boys, C. V.* L. Ps. S. P. 3 (1880) 17-; Ph. Mg. 7 (1879) 108.
- , and insensible refraction which accompanies it, theory. *Maccullagh, J.* B. A. Rp. (1843) (pt. 2) 4-.
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- , phenomena. *Pulfrich, C.* Bonn Niedr. Gs. Sb. (1887) 216-.
- , simple method for Newton's experiment. *McNair, F. W.* Science 5 (1897) 620-.
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— —, minimum deviation for combined. *Kessler, F.* [1881] A. Ps. C. 15 (1882) 330-.

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*Glasener, M.* Liège Mm. S. Sc. 2 (1845-46) 477-.

*James, (Sir) H.* B. A. Rp. (1858) (pt. 2) 38.

*Pichot, J.* C. R. 48 (1859) 1118-.

*Bauer, K. L.* Carl Rpm. 3 (1867) 34-.

*Gruzincev, A. P.* Kharkov Mth. S. Com. 1 (1889) 139-.

of benzene. *Bernackij, V.* [1891-92] Vars. S. Nt. Tr. (Mm.) 2 (1892) No. 5, 58 pp.; Fschr. Ps. (1891) (Ab. 2) 53; Vars. S. Nt. Tr. (1892-93) (C. R., Ps. C.) No. 1, 15-.

— bodies. *Lorenz, L.* [1869-75] Kjöb. Dn. Vd. Selsk. Skr. 8 (1870) 203-; 10 (1875) 483-.

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—, illustrated mechanically. *Mach, E.* Carl Rpm. 7 (1871) 375-.

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— — and equations of surfaces defined by it. *Röhlig, O.* Crelle J. Mth. 84 (1878) 231-; 88 (1880) 22-.

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— — — water. *Bermann, O.* Schlömilch Z. 8 (1863) 204-.

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of porous substances. *Frankenheim, M. L.* Oken Isis (1834) 599-.

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— — — *Kessler, F.* A. Ps. C. 16 (1882) 362-.

— — —, geometrical methods in theory. *Loudon, J.* Ph. Mg. 18 (1884) 485-.

— surface of snow. *Whitney, A. W.* Am. J. Sc. 45 (1893) 389-.

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 — — *Willigen, V. S. M. van der.* [1867] *Harl. Arch. Ms. Teyl. 1* (1868) 282-.

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*Sainte-Claire Deville, H. A. C. 5* (1842) 129-; *C. R. 14* (1842) 838-.  
*Jamin, J. C. R. 45* (1857) 892-.  
*Zenger, C. W. Brux. Ac. Bll. 8* (1859) 191.  
*Baille, J. B. Par. A. Cons. 7* (1867) 184-.  
*Willigen, V. S. M. van der.* [1870] (xi) *Haarl. Ms. Teyl. Aroh. 3* (1874) 67-.  
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*Bernard, F. B. A. Rp.* (1854) (pt. 2) 2-; *C. R. 39* (1854) 27-; 41 (1855) 580-.  
*Pichot, J. C. R. 48* (1859) 120-.  
*Zinken genannt Sommer, H. Pogg. A. 107* (1859) 47-.  
*Meyerstein, M. Pogg. A. 114* (1861) 140-.  
*Gibbs, O. W. Am. Ac. P. 10* (1875) 401-.  
*Waha, M. de. Lux. I. Pb. 16* (1877) 143-.  
*Wagner, A. (xii) Kolozsvár Orv.-Term. Társ. Éts. [3]* (1879) (*Term. Szak*) 37-.  
*Lommel, E. Z. Instk. 5* (1885) 124-, 200.  
*Fori, E. Ra. Pa.-C. S. J. 20* (*Ps.*) (1888) 230-; *Fachr. Ps.* (1888) (*Ab. 2*) 47.  
*Walser, B. Hamb. Ws. Anst. Jb. 9* (*Pt. 1*) (1891) 255-.  
*Aubert, A. B. Am. Mor. J. 13* (1892) 225-.  
*Rawlins, B. L. Am. Mer. J. 18* (1897) 155-.  
*Tolomei, G. Rv. Sc. Ind. 29* (1897) 279-.  
*Weiss, G. J. de Ps. 6* (1897) 688-.  
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 — ammonium sulphate. *Erofejeff, M. Wien Sb. 55* (1867) (*Ab. 2*) 543-.  
 by angle of polarisation. *Pfaff, (Dr.) F. A. Pa. C. 127* (1866) 150-.  
 — — — (*Pfaff*). *Des Cloiseaux, A. A. Pa. C. 129* (1866) 479-.  
 of anisotropic microscopic objects. *Ambrohn, H. Leip. Mth. Pa. B. 45* (1893) 816-.  
 by auto-collimation. *Féry, C. C. R. 119* (1894) 402-; *As. Fr. C. R.* (1895) (*Pt. 2*) 437-.  
 of crystals, by prism. *Viola, C. Z. Instk. 19* (1899) 276-.  
 — fluids, Brewster's method. *Zehender, W. Arch. f. Oph. 3* (1867) (*Ab. 1*) 99-.  
 — gases. *Biot, J. B., & Arago, —. Par. Mm. de l'I. 7* (1806) 301-.  
 — — — (*Biot and Arago*). *Gilbert, L. W. Gilbert A. 26* (1807) 36-.  
 — — — *Jamin, J. A. C. 49* (1857) 290-.  
 — — — (liquefied). *Zahn, W. von. Leip. Nf. Gs. Sb. 5* (1876) 34-.  
 — — — (*—*). *Dechant, J. Wien Ak. Sb. 90* (1885) (*Ab. 2*) 539-; *Mh. C.* (1884) 615-.  
 — — —, influence of temperature and pressure. *Mascart, É. É. N. C. R. 78* (1874) 617-; *Par. Éc. Norm. A. 6* (1877) 9-.

of glass, etc. *Krusper, S. von. Ung. NW. Vr. Jb.* (1858) 106-.  
 — — plates. *Wiedemann, E. E. G. Aroh. Sc. Pa. Nt. 51* (1874) 340-.  
 — glowing platinum. *Zeeman, P. Amst. Ak. Vs. 4* (1896) 116-.  
 at high temperatures, by total reflectometer. *Brühl, J. W. Berl. B. 24* (1891) 286-.  
 of immersion fluids. *Smith, H. L. Am. S. Mer. P.* (1885) 83-.  
 — liquids. *Forthomme, C. A. C. 60* (1860) 307-.  
 — — — *Montigny, C. Brux. Ac. Bll. 18* (1864) 10-.  
 — — — *Croullebois, M. A. C. 22* (1871) 189-.  
 — — — *Terquem, A., & Trannin, H. C. R. 78* (1874) 1843-; *J. de Ps. 4* (1875) 232-.  
 — — — *Waha, M. de. J. de Ps. 6* (1877) 186-.  
 — — — *Macé de Lépinay, J. J. de Ps. 9* (1880) 200-.  
 — — — (coloured). *Christiansen, C. Kjöb. Ov.* (1882) 217-; *A. Pa. C. 19* (1888) 257-.  
 — — — (heterogeneous). *Littlewood, T. H. L. Pa. S. P. 13* (1895) 74-; *Ph. Mg. 37* (1894) 467-.  
 — — —, by Billet's liquid compensator. *Croullebois, M. A. C. 22* (1871) 509-.  
 — — —, — fluid lenses. *Pil'chikov, N. D. (xii) Ra. Pa.-C. S. J. 13* (*Ps.*) (1881) [(*Pt. 1*)] 393-.  
 — — — and glass plates. *Wiedemann, E. E. G. A. Pa. C. 158* (1876) 375-.  
 — — —, simple method. *Bodyński, J. Carl Bpm. 18* (1882) 502-.  
 — — —, by telescope and scale method. *Ruoss, H. A. Pa. C. 48* (1893) 531-.  
 — — —, use of hollow prisms. *Pařezek, A. P., & Šulo, O. Prag České Ak. Fr. Jos. Rs. (Třída 2) 3* (1894) *Art. 1*, 80 pp.  
 without measurement of angles. *Zenger, C. V. C. R. 99* (1884) 377-.  
 and measurement of curvature. *Boys, C. V. Ph. Mg. 14* (1882) 30-.  
 by microscope. *Kayser, E.* [1888] *Dannig Schr. 7* (1888-91) (*Heft 2*) xi-.  
 — — —, of glass. *Royston-Pigott, G. W. QJ. Mer. Sc. 12* (1872) 273-.  
 — — —, — liquids. *Harting, P. J. Mer. Sc. 6* (1858) 107-.  
 — — —, — — —. *Sorby, H. C. C. S. J. 38* (1878) 487-.  
 — — —, — — —. *Thompson, G. Nt. 34* (1886) 157-.  
 — — —, — — — and transparent plates. *Bertin, A. A. C. 26* (1849) 288-; *C. R. 28* (1849) 447-.  
 of microscopic objects. *Israel, O. Z. Ws. Mkr. 16* (1899) 349-.  
 — minerals, by total reflection. *Thoulet, M. J. O. (xii) Fr. S. Mn. Bll. 6* (1883) 184-.  
 — mixed alcohols. *Blaserna, P. Gz. C. It. 2* (1872) 69-.  
 — mounting media, method. *Nelson, E. M. Mor. S. J.* (1892) 141-; (1894) 655-.  
 — opaque bodies. *Malus, É. L.* [1807] *Par. Mm. Sav. Etr. 2* (1811) 509-.  
 — parallel faced bodies. *Croullebois, M. C. R. 68* (1869) 1209-.



- by photography. *Lumière, A., & Lumière, L.* C. R. 124 (1897) 1488-.
- Poggendorff's method. *Biervliet, — van.* Brux. S. Sc. A. 12 (1888) (Pt. 1) 74-.
- of prism. *Geronsi, B. T.* Rv. Sc.-Ind. 28 (1891) 221-.
- by prism and by total reflection. *Dufet, H.* Par. S. Ps. Sé. (1891) 212-.
- of quartz. *Esselbach, E.* Pogg. A. 98 (1856) 541-.
- rapid. *Cominotto, E.* Rv. Sc.-Ind. 32 (1900) 49-.
- by sextant. *Swan, W.* [1848] Edinb. N. Ph. J. 36 (1844) 102-.
- of small crystals. *Sorby, H. C.* Mn. Mg. 1 (1877) 97-.
- solids. *Feusner, K. N.* Jb. Mn. (1883) (Bd. 2) 89-.
- strong solution of cyanin. *Lang, V. von.* [1881] Wien Ak. Sb. 84 (1882) (Ab. 2) 361-.
- — — — — (Lang). *Pulfrich, C.* A. Ps. C. 16 (1882) 385-.
- sugar solutions. *Obermayer, A. von.* Wien Sb. 61 (1870) (Ab. 2) 797-.
- by total reflection. *Kohlrausch, F.* [1877-78] Würsb. Ps. Md. Vh. 12 (1878) 108-; A. Ps. C. 4 (1878) 1-.
- — — — — *Quincke, G. H.* Halle Nf. Gs. Festschr. (1879) 321-.
- — — — — *Meyer, O. E.* Breal. Schl. Gs. Jbr. (1889) 111.
- Wollaston's method, modification. *Kohlrausch, F.* A. Ps. C. 16 (1882) 603-.
- cadmium salt-solutions. *Muynek, R. de.* A. Ps. C. 53 (1894) 559-.
- calcium chloride solutions. *Bremer, G. J. W.* Arch. Néerl. 5 (1900) 202-.
- compound ethers. *Long, J. H.* Am. J. Sc. 21 (1881) 279-.
- cyanogen. *Chappuis, J., & Rivière, C.* C. R. 104 (1887) 1433-.
- for D line of dry air from astronomical observations. *Comstock, G. C.* Washburn Obs. P. 9 (1896) 202.
- ebonite. *Perry, J., & Ayrton, W. E.* L. Pa. S. P. 4 (1881) 345-; Ph. Mg. 12 (1881) 196-.
- ethyl ether. *Oudemans, A. C. (jun.)* Amst. Ak. Vs. M. 1 (1885) 426-; Delft Ec. Pol. A. 3 (1887) 1-.
- — — — — near critical point. *Golicyn, (Prince) B., & Wilip, J.* St. Pé. Ac. Sc. Bil. 11 (1900) 117-.
- fluorite, in infra-red. *Paschen, F.* A. Ps. C. 56 (1895) 762-.
- fused salts. *Arons, L.* A. Ps. C. 53 (1894) 95-.
- gases (liquefied). *Blackrode, L.* A. Ps. C. 8 (1879) 400-; R. S. P. 37 (1884) 339-.
- — — — — *Rivière, C., & Chappuis, J.* Par. S. Ps. Sé. (1886) 188.
- (liquefied). *Chappuis, J.* C. R. 114 (1892) 286-.
- — — — — Arago's interference apparatus. *Cornu, A.* (ix) Par. S. Phlm. Bil. 4 (1867) 2-.
- — — — — under high pressure. *Chappuis, J., & Rivière, C.* C. R. 96 (1883) 699-; Par. S. Ps. Sé. (1883) 193-.
- — — — — and vapours. *Mascart, É. É. N.* C. R. 86 (1878) 321-.
- glass, influence of temperature. *Pulfrich, C.* A. Ps. C. 45 (1892) 609-.
- — — — — and quartz. *Quincke, G. H.* Edinb. R. S. P. 9 (1878) 567-.
- glycerin solutions. *Strohmer, F.* Wien An. 20 (1883) 237-.
- hydrophane saturated with liquids. *Šteglajev, J.* A. Ps. C. 64 (1896) 325-; 65 (1896) 745.
- ice. *Meyer, G.* A. Ps. C. 31 (1887) 321-.
- Island spar. *Dufet, —.* Par. S. Pa. Sé. (1894) 95-.
- liquid nitrogen and air. *Living, G. D., & Dewar, J.* Ph. Mg. 36 (1893) 323-.
- — — — — oxygen, nitrous oxide and ethylene. *Living, G. D., & Dewar, J.* Ph. Mg. 34 (1892) 206-.
- liquids. *Becquerel, E., & Cahours, A.* C. R. 11 (1840) 867-.
- — — — — *Damien, B. C.* Par. Éc. Norm. A. 10 (1881) 233-.
- — — — — (relations between compressibility and refractive indices). *Quincke, G.* A. Ps. C. 44 (1891) 774-.
- — — — — of feeble dispersion. *Willigen, V. S. M. van der.* [1867] Harl. Arch. Ms. Teyl. 1 (1868) 161-.
- — — — — indices greater than 1.8. *Bertrand, É.* Fr. S. Mn. Bil. 11 (1888) 81.
- metal chlorides in solution. *Willigen, V. S. M. van der.* Harl. Arch. Ms. Teyl. 2 (1869) 222-.
- metals. *Quincke, G.* Pogg. A. 120 (1863) 599-.

REFRACTIVE INDICES OF  
VARIOUS SUBSTANCES.

- acids. *Willigen, V. S. M. van der.* Harl. Arch. Ms. Teyl. 2 (1869) 238-.
- air. *Chappuis, J., & Rivière, C.* C. R. 102 (1886) 1461-.
- alcohol and aniline. *Johst, W.* A. Ps. C. 20 (1883) 47-.
- — — — — glycerin solutions. *Willigen, V. S. M. van der.* Harl. Arch. Ms. Teyl. 2 (1869) 199-.
- alcoholic solution of fuchsine. *Christiansen, C.* A. Ps. C. 141 (1870) 479-.
- alums (for various wave-lengths). *Soret, C.* C. R. 99 (1884) 887-, 1000; 101 (1885) 156-.
- aniline red. *Christiansen, C.* Kjøb. Ov. (1871) 5-.
- aqueous solutions. *Damien, B. C.* C. R. 91 (1880) 323-.
- argon and helium. *Rayleigh, (Lord).* Nt. 52 (1895) 533; R. S. P. 59 (1896) 198-.
- benzene. *Willigen, V. S. M. van der.* Harl. Arch. Ms. Teyl. 2 (1869) 218-.
- — — — — *Vostokov, I. A.* Vars. S. Nt. Tr. (1891-92) (C. R., Ps. C.) No. 3, 13-.
- — — — — *Bernackij, V.* [1891-92] Vars. S. Nt. Tr. (Mm.) 2 (1892) No. 5, 58 pp.; Fachr. Ps. (1891) (Ab. 2) 53; Vars. S. Nt. Tr. (1892-93) (C. R., Ps. C.) No. 1, 15-.
- bismuth nitrate solution. *Ditscheiner, L.* Wien Sb. 49 (1864) (Ab. 2) 326-.
- bodies gaseous at ordinary temperatures only. *Leroux, F. P.* A. C. 61 (1861) 385-.
- bromine. *Rivière, C.* C. R. 131 (1900) 671-.

metals. *Kundt*, —. [1888] *Gen. S. Pa. Mm.* 30 (1888-90) lxxiii-.

— *Abel, E. van*. *Brux. S. Sc. A.* 24 (1900) (Pt. 1) 64-.

mica and pennine. *Haidinger, W.* *Wien Sb.* 14 (1854) 330-.

mineral waters. *Riegler, E.* *Bucarest S. Sc. Bl.* 9 (1900) 251-.

native barium, strontium and lead sulphates, effect of heat. *Arzruni, A.* (xii) *Z. Kr.* 1 (1877) 165-.

optical glass of several kinds. *Mascart, É.* *A. C.* 14 (1868) 144-.

phosphorus dissolved in carbon disulphide. *Whitmill, C. T.* *Nt.* 11 (1876) 307.

potassium nitrate and sodium chloride solutions. *Schmidt, W.* *Pogg. A.* 107 (1859) 539-.

quartz (various kinds). *Dufet, H.* *Par. S. Ps. Sé.* (1890) 193.

— *Macé de Lépinay, J.* *Mars. Fac. Sc. A.* 5 (1896) *Fasc.* 2, 14 pp.

—, effect of calcination. *Brun, A.* *Aroh. So. Ps. Nt.* 2 (1896) 657-.

rock-forming minerals (for sodium light). *Zimányi, K.* [1893] *Mag. Tud. Ak. Etk. (Term.)* 23 (1894) No. 2, 72 pp.; *Mth. Nt. B. Ung.* 11 (1894) 189-.

rock salt. *Langley, S. P.* *Am. J. Sc.* 30 (1885) 477-.

—, sylvin and fluorite (for very long wave-lengths). *Rubens, H., & Snow, B. W.* *A. Ps. C.* 46 (1892) 529-.

saline solutions. *Beer, A., & Kremers, P.* *Pogg. A.* 101 (1857) 133-.

—, *Bary, P. C. R.* 114 (1892) 827-.

sea water. *Soret, J. L., & Sarasin, É.* *Aroh. Sc. Ps. Nt.* 21 (1889) 509-.

—, *Manley, J. J.* [1900] *Edinb. R. S. P.* 23 (1902) 85-.

sodium salt solutions. *Willigen, V. S. M. van der.* [1870] (xi) *Haarl. Ms. Teyl. Aroh.* 3 (1874) 15-.

several substances. *Powell, B.* *B. A. Rp.* (1850) (pt. 2) 14-.

—, table. *Brewster, (Sir) D.* *QJ. Sc.* 22 (1827) 355-.

—, *Herschel, (Sir) J. F. W.* *Edinb. J. Sc.* 10 (1829) 296-.

substitution products of carbonic ether. *Wiedemann, E.* *J. Pr. C.* 114 (1878) 453-.

water (distilled). *Willigen, V. S. M. van der.* *A. Ps. C.* 122 (1864) 191-; *Amst. Vs. Ak.* 16 (1864) 332-.

— *Croullebois, M.* *C. R.* 70 (1870) 847-, 1022, — (Croullebois). *Jamin, J.* *C. R.* 70 (1870) 966-.

— *Brühl, J. W.* *Berl. B.* 24 (1891) 644-.

— *Walter, B.* *A. Ps. C.* 46 (1892) 423-.

—, carbon disulphide, monobromonaphthalene, terebenthene, alcohol, quartz, fluorite, beryl. *Dufet, H.* *Fr. S. Mn. Bl.* 8 (1885) 171-.

— vapour. *Jamin, J.* *A. C.* 52 (1858) 171-.

white light refracted without sensible dispersion. *Montigny, C.* *Brux. Ac. Bil.* 19 (1865) 177-.

## REFRACTOMETERS.

*Royston-Pigott, G. W.* *M. Mer. J.* 5 (1871) 65-.

*Abbe, E.* *Jena. Sb.* (1879) 35-.

*Pulfrich, C.* *Z. Instk.* 8 (1888) 47-.

*Féry, C.* *C. R.* 113 (1891) 1023-; *As. Fr. C. R.* (1892) (Pt. 2) 245-.

*Pulfrich, C.* *Z. Ps. C.* 18 (1895) 294-; *J. de Ps.* 5 (1896) 73-.

*Abbe's. Appel, J.* *Ts. Ps. C.* 27 (1888) 164-.

— *Czapski, S.* *Z. Instk.* 10 (1890) 246-, 289-.

— *Feussner, W.* *Z. Instk.* 14 (1894) 87-.

—, new arrangements. *Pulfrich, C.* *Z. Instk.* 18 (1898) 107-.

for analysis of oils and butter. *Amagat, E. H., & Jean, F.* *C. R.* 109 (1889) 616-.

*Bertrand's. Hausser, W.* *Gén. Civ.* 9 (1886) 44-.

for butter experiments. *Poleck, —.* *Breal. Schl. Gs. Jbr.* (1894) (Ab. 2a) 111-.

differential. *Trannin, H.* *As. Fr. C. R.* (1885) (Pt. 1) 105-.

— *Doumer, E. J.* *de Ps.* 9 (1890) 191-.

— (Zeiss's). *Anon. Mor. S. J.* (1900) 722-.

—, for liquids. *Hallwachs, W.* *A. Ps. C.* 50 (1893) 577-.

educational (Zeiss's). *Anon. Mor. S. J.* (1900) 636-.

form. *Royston-Pigott, G. W.* *M. Mer. J.* 16 (1876) 294-.

—, new. *Hallwachs, W.* *Dresden Isis Sb.* (1898) (Ab.) 49-.

with heating arrangement. *Leiss, C.* *Z. Instk.* 19 (1899) 65-.

immersion- (Zeiss's). *Anon. Mor. S. J.* (1900) 721-.

lens-, for liquids. *Pilčikov, N.* *Par. S. Ps. Sé.* (1889) 61-.

for liquids. *Soret, C.* *Aroh. So. Ps. Nt.* 19 (1888) 264-.

— *Sondén, —.* *Nt.* 44 (1891) 478.

— or gases (Dupré's). *Pellin, P.* *Par. S. Ps. Sé.* (1889) 85-.

new. *Viola, C.* *Z. Instk.* 19 (1899) 276-.

for solids. *Soret, C.* *C. R.* 95 (1882) 517-; *Aroh. So. Ps. Nt.* 9 (1883) 5-.

total reflection. *Kohrausch, F.* *A. Ps. C.* 16 (1882) 809-.

— *Pulfrich, C.* *A. Ps. C.* 30 (1887) 193-, 487-; 31 (1887) 724-; *Z. Instk.* 7 (1887) 16-, 55-, 392-; *A. Ps. C.* 36 (1889) 561-.

for use with the microscope. *Starke, H.* *D. Ps. Gs. Vh.* (1899) 117-.

using Newton's rings. *Royston-Pigott, G. W.* *R. S. P.* 24 (1876) 393-.

with variable refracting angle. *Pulfrich, C.* *Z. Instk.* 19 (1899) 385-.

for Wollaston's method. *Liebsch, T.* *Z. Instk.* 4 (1884) 185-; 5 (1885) 13-.

Wollaston's, improvements. *Cooper, J. T. C.* *S. Mm.* 1 (1841-48) 234-.

- Salt invisible in its mother liquor. *Tomlinson, C. Ph. Mg.* 40 (1870) 328-.
- Shadows under water, effects due to. *Hutchinson, H. N.* [1875] *Rugby NH. S. Rp.* (1876) 22-.
- Sphere, homogeneous, course of light-rays in. *Lippich, F.* *Wien Ak. Sb.* 79 (1879) (Ab. 2) 516-.
- , optical property. *Hermann, L.* *Zür. Vjschr.* 19 (1874) 418-, 428.
- Strophoid; application in geometrical optics. *Loria, G.* *N. A. Mth.* 16 (1897) 262-.
- Surface images. *Mannoury, G.* *N. Arch. Wisk.* 4 (1899) 112-.
- Surfaces of 2nd degree, mechanical method of producing. *Plücker, J.* *Crelle J.* 34 (1847) 357-.
- , optical, production. *Brashear, J. A.* *Am. As. P.* (1884) 255-.
- , tests for planeness and parallelism. *Gibbs, W.* *Am. J. Sc.* 50 (1870) 53-.
- Tracing paper for copying drawings. *Lasteyrie, —.* *Tilloch Ph. Mg.* 47 (1816) 182-.
- Transmission of light through bent tubes. *Babinet, J. C. R.* 15 (1842) 802.
- Transparent bodies, action on differently coloured rays. *Brewster, (Sir) D.* [1815] *Edinb. R. S. T.* 8 (1818) 1-.
- plates, interference apparatus for testing parallelism. *Czapski, S.* *Z. Instk.* 5 (1885) 149-.
- Vision through glass plate. *Gergonne, J. D.* [1823] *Gergonne A. Mth.* 14 (1823-24) 1-.
- Water, scenic effects due to. *Inman, T. (x)* *Lpool. Lt. Ph. S. P.* 27 (1873) 215-.
- Window-glass, phenomenon with. *Tait, P. G.* *Edinb. R. S. P.* 11 (1882) 418-.
- Ricour, T. C. R.* 69 (1869) 1231-; 70 (1870) 115-.
- Willigen, V. S. M. van der.* *Harl. Arch. Ma. Teyl.* 2 (1869) 308-.
- (Lommel, Glasebrook and Mathieu.) *Ketteler, E. A. Ps. C.* 15 (1882) 613-.
- Klercker, C. E. de.* [1882-83] *Stockh. Ak. Hndl. Bh.* 7 (1882-83) No. 1, 54 pp.; *C. R.* 95 (1882) 598-; *Stockh. Ak. Hndl. Bh.* 8 (\*1883-84) No. 10, 36 pp.; *C. R.* 97 (1883) 707-.
- of air. *Runge, C.* *As. & Asps.* 12 (1893) 426-.
- , new method of determining. *Rydberg, J. R.* *Stockh. Öfv.* (1893) 693-; *Fschr. Ps.* (1893) (Ab. 2) 46.
- chromatic. *Petruševskij, T.* *Ra. Pa.-C. S. J.* 28 (Ps.) (1896) 91-; *Fschr. Ps.* (1896) (Ab. 2) 38.
- , laws. *Ponton, M.* [1859] *Ph. Mg.* 19 (1860) 165-, 263-, 364-.
- , — (Ponton). *Stewart, B.* *Ph. Mg.* 20 (1860) 143-.
- , —. *Ponton, M.* *Ph. Mg.* 20 (1860) 253-.
- of colourless transparent media. *Wallner, F. H. A. A.* *A. Pa. C.* 17 (1882) 580-.
- determination with very small prisms. *Babinet, J. C. R.* 21 (1845) 513-.
- and deviation, mode of increasing. *Kohlrusch, F. A. Pa. C.* 143 (1871) 147-.
- of diamond. *Schrauf, A.* *A. Pa. C.* 22 (1884) 424-; 26 (1885) 644.
- fluorite. *Langley, S. P.* *Smiths. I. Asps. Obs. A.* 1 (1900) 219-.
- formula. *Powell, B.* *Ph. Mg.* 9 (1836) 116-.
- *Mascart, E.* *Par. Ec. Norm. A.* 1 (1864) 263-.
- *Carvalho, E.* [1900] *So. Abs.* 4 (1901) 488.
- with only 2 constants. *Lommel, E. C. J.* *Erlang. Ps. Md. S. Sb.* 11 (1879) 191-.
- , experimental proofs. *Brühl, J. W.* *Lieb. A.* 236 (1886) 233-.
- of gases. *Ketteler, E.* *Berl. Mb.* (1864) 630-.
- *Croullebois, M.* *C. R.* 68 (1869) 778-.
- *Mascart, E. E. N.* *C. R.* 78 (1874) 679-.
- glass. *Barlow, P.* *Phil. Trans.* (1827) 281-.
- , simple and accurate method for ratio. *Stokes, G. G.* *R. S. P.* 27 (1878) 485-.
- glycerin. *Listing, J. B.* *Gött. Nr.* (1869) 203-.
- gypsum. *König, W.* *A. Ps. C.* 69 (1899) 1-.
- Iceland spar. *Carvalho, E.* *J. de Ps.* 9 (1900) 465-.
- laws. *Ketteler, E.* *A. Ps. C.* 7 (1879) 658-.
- *Mouton, L.* *C. R.* 88 (1879) 1189-.
- *Hesse, O.* *A. Ps. C.* 11 (1880) 871-.
- *Lommel, E. C. J.* *Erlang. Ps. Md. S. Sb.* 13 (1881) 24-.
- , of calorific rays, and measurement of their wave-lengths. *Mouton, L.* *A. C.* 18 (1879) 145-.
- of liquid oxygen. *Olazowski, K., & Witkowski, A.* *Crc. Ac. Sc. Bil.* (1894) 245-.
- mercuric iodide solution. *Living, G. D.* [1879] *Camb. Ph. S. P.* 3 (1880) 258-.

## 3030 Spectrometry. Dispersion.

(See also 3800; Chemistry 7310.)

- Coloured light for dark rooms, measurement. *Abney, (Capt.) W. de W.* *Phot. J.* 10 (1866) 114-, 138-.
- Colours, experiments. *Pownall, —.* *Tilloch Ph. Mg.* 12 (1802) 42-, 107-.
- , Newton's seven. *Mollweide, C.* *Gehlen J.* 1 (1806) 651-.
- , physical investigations. *Venturi, G.* *Mod. S. It. Mm.* 8 (1799) 699-.
- , prismatic. *Tenney, S.* [1792] *Bost. Mm. Am. Ac.* 2 (1793) 37-.
- , —. *Mons, J. B. van.* (vi *Adds.*) *V. Mons J. C.* 6 (1804) 106-, 242-.
- Dispersionometer, construction. *Mousson, A.* *Sch. Gs. Vh.* 55 (1872) 183-.
- DISPERSION.
- Rudberg, F.* *Pogg. A.* 9 (1827) 483-.
- Amici, G. B.* *Pogg. A.* 35 (1835) 609-.
- Hunt, E. B.* *Silliman J.* 7 (1849) 364-.
- Christoffel, E. B.* *Berl. Mb.* (1861) 906-.
- Briot, C.* *C. R.* 57 (1863) 866-.
- Mathieu, E.* *C. R.* 59 (1864) 885-; *Liouv. J. Mth.* 11 (1866) 49-.

- method of measuring in different parts of spectrum. *Mousson, A.* Arch. So. Ps. Nt. 45 (1872) 13.
- number of points in spectrum required for exact knowledge. *Willigen, V. S. M. van der.* Harl. Arch. Ms. Teyl. 1 (1868) 275-.
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- , best form. *Latchinoff, D.* *Lum. Élect.* 4 (\*1881) 151-.
- , fluid. *Perkins, G. R.* *Camb. (M.) Mth. M.* 1 (1859) 79-.
- , Foucault's method of autocollimation applied to. *Martin, A.* C. R. 70 (1870) 446-.
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- , preparation by centrifugal force, Latchinoff's method. *Guéroul, A.* *Lum. Élect.* 4 (\*1881) 70-.
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- , test for use in making. *Heise, C. G.* *Cztg. Opt.* 16 (1895) 49.
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- , glass, multiple images. *Gergonne, J. D.* *Nancy Tr. S. Sc.* (1811-12) 7-; *Gergonne A. Mth.* 5 (1814-15) 283-.
- , —, —. *Strattingh, S. E.* A. Ps. C. 122 (1864) 462-.
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- , —, number of images. *Gallenkamp, W.* *Pogg. A.* 82 (1851) 598-.
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- , —, —, —. *Pina Vidal, A. A. de.* *Lisb. J. Sc. Mth.* 3 (1871) 232-.
- , —, —, —. *Klein, H.* *A. Ps. C.* 152 (1874) 506-.
- , —, —, —. *Schubert, H. C. H.* [1881] *Hamb. Mth. Gs. Mt.* 1 (\*1889) 18-.
- , —, production of images. *Lefebvre, E.* *J. de Ps.* 8 (1879) 129-.
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- , —, theory. *Maurer, H.* *Aroh. Mth. Ps.* 9 (1890) 1-.
- , light, new form. *Mallock, A.* *R. S. P.* 64 (1899) 440-.
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- , reflection from. *Köpl, K.* [1875] *Arch. Mth. Ps.* 60 (1877) 356-.
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- , versus right-angled prisms. *Hunt, G.* *Mcr. S. J.* 5 (1885) 709-.
- , —, —. *Nelson, E. M.* *Mcr. S. J.* 5 (1885) 864.
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- , use in physics. *Oettingen, A. von.* *Cztg. Opt.* 8 (1887) 229-, 268-.
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- , —. *Rouché, E.* *N. A. Mth.* 14 (1855) 156-.
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- Optical effects of mirrors and lenses, explanation, simple method. *Tait, P. G.* [1871] *Edinb. R. S. P.* 7 (1872) 412-.
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- , —, —, apparatus for drawing loci of images. *Bauer, K. L.* *A. Ps. C.* 33 (1888) 218-.
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- , spherical, separating two different refracting media, corresponding points on the central and centric planes. *Govi, —.* Rm. R. Ac. Linc. Bd. 5 (1889) (Sem. 1) 307-.
- Surfaces, convex, indicatrix and mean curvature. *Faye, H. A. É.* C. R. 92 (1881) 1019-.
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- — — —, general. *Biot, J. B.* C. R. 19 (1844) 495-.

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- , of telescope and eye. *Strehl, K.* Z. Instk. 17 (1897) 77-, 128.
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- — — —, *Lorenzoni, G.* As. Nr. 78 (1872) 289-, 349-.
- minimum, of single lens for parallel rays. *Rayleigh, (Lord).* Camb. Ph. S. P. 3 (1880) 373-.
- monochromatic, general theory, and results for ophthalmology. *Gullstrand, A.* [1900] Ups. S. Sc. N. Acta 20 (1904) No. 4, 204 pp.
- of objectives, elimination (Euler). *Goring, C. R.* Edinb. J. Sc. 5 (1831) 238-.
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- , of lenses and dioptric systems. *Ferrini, R.* Mil. I. Lomb. Rd. 13 (1890) 283-, 361-.
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- , — — — — (Hoegh). *Czapski, S.* Z. Instk. 8 (1888) 203-.
- , in telescopes of Gregory and Cassegrain. *Naccari, A., & Battelli, A.* Tor. Ac. Sc. At. 20 (1865) 862-.
- , of wide-angled objectives, improvement of correction for. *Abbe, E.* Mcr. S. J. 2 (1879) 812-.
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- Pitsch, H.* Wien Ak. Sb. 100 (1891) (Ab. 2a) 1105-.
- Strehl, K.* Cztg. Opt. 18 (1897) 91-.
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- , objectives. *Godfrey, J.* Mer. S. J. (1890) 659-.
- , —, calculations. *Bohnenberger, G. C.* Lindenau Z. 1 (1816) 277-, 385-.
- , —, —. *Strehl, K.* Cztg. Opt. 17 (1896) 23-.
- , —, construction. *Munchow, K. D. von.* Lindenau Z. 2 (1816) 448-.
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- , —, construction of large. *Steinheil, C. A. von.* [1835] Münch. Gelehrte Az. 2 (1836) 347 [337]-.
- Achromatisation. *Fischer, G.* Cztg. Opt. 4 (\*1883) 220-, 229-, 253-, 265-; 5 (1884) 121-, 134-, 159-.
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- , —, —, and indices of refraction. *Souza Pinto, R. R. de.* Coimbra I. 4 (1856) 167-, 179-, 203-.
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- Camera drawings and photomicrographs, tables for correcting errors. *Nelson, E. M.* [1896] Quek. Mer. Cl. J. 6 (1897) 289-.
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- Colour of best definition in lenses, instrument to find. *Schröder, H.* Cztg. Opt. 20 (1899) 118-, 122-.
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- — — — — microscopes. *Gundlach, E.* Am. S. Mor. P. (1886) 157-.
- — — — — optical instruments, theory. *Seidel, L.* Münch. Nt. Tech. Com. Ab. 1 (1857) 227-.
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- Fluorite, use in optical instruments. *Thompson, S. P.* [1890] Ph. Mg. 31 (1891) 120-.
- , — for optical purposes. *Abbe, E.* Z. Instk. 10 (1890) 1-.
- Luminous bodies, method of obtaining monochromatic images. *Janasen, J.* B. A. Rp. 39 (1869) (Sect.) 23.
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- — — — —, effect of refraction. *Venturi, A.* Rm. B. Ac. Linc. Bd. 5 (1889) (Sem. 1) 357-.
- — — — —, formula for. *Cerulli, V.* Rm. B. Ac. Linc. Rd. 5 (1889) (Sem. 1) 770-.

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- Perty, M.* Bern Mt. (1856) 137-; (1862) 83-.
- Jadanza, N.* Tor. Ac. Sc. At. 23 (1887-88) 570-.
- Schröder, H.* Z. Instk. 12 (1892) 153-.
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- Cauchois's*; and *d'Artigues's* flint-glass. *Gilbert, L. W.* Gilbert A. 37 (1811) 877-.
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- — — — — *Barlow's Brewster, (Sir) D.* Edinb. J. Sc. 7 (1827) 335-.
- — — — — *Baily, F.* As. Nr. 6 (1828) 141-.
- — — — — *Precht, J. J.* Wien Jb. Pol. I. 13 (1828) 125-.
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- Amici's* prism, and curvature of prismatic images. *Larmor, J.* Camb. Ph. S. P. 7 (1892) 85-.
- anallatic. *Goulier, C. M.* C. R. 80 (1875) 292-.
- , displacement of lens. *Jadanza, N.* Tor. Ac. Sc. At. 23 (1887-88) 294-.
- , Porro's. *Cavani, F.* Bologna Ac. Sc. Mm. 3 (1892) 371-.
- , theory. *Young, A. E.* I. CE. P. 139 (1900) 336-.
- application of concave lenses. *Pilz, O.* Cztg. Opt. 20 (1899) 41-.
- astronomical, formula for field. *Meisel, F.* Cztg. Opt. 9 (1888) 133.
- , new (plesiotlescope). *Jadanza, N.* Rv. Sc.-Ind. 18 (1886) 61-.
- , for photography. *Common, A. A.* Nt. 31 (1885) 38-, 270-.
- , theory of bending applied to design. *Yvon-Villarceau, A. J. F.* C. R. 98 (1881) 14-, 107-.
- bending. *Yvon-Villarceau, A. J. F.* C. R. 98 (1881) 449-, 866-.
- *Updegraff, M.* [1896] St. Louis Ac. T. 7 (1894-97) 243-.
- brightness of images with different eyepieces. *Pohl, J. J.* Dingler 191 (1869) 275-.
- cathetometer for long distances. *Dévé, C.* C. R. 126 (1898) 636-.

## 3080 Galileo's Telescope

- collimation, use of mercury reflector in. *Cornu, A. C. B.* 68 (1869) 720-.
- with coloured glasses. *Brewster, (Sir) D.* *Edinb. Ph. J.* 6 (1822) 102-.
- construction, new. *Strehl, K. Z. Instk.* 14 (1894) 206-.
- deformation of images. *Govi, G. Rm. R. Ac. Linc. Mm.* 18 (1893) 403-.
- diffraction phenomena in focal plane. *Nagao-ka, H. Tök. Coll. So. J.* 9 (1895-98) 821-.
- a Dutch invention. *Linde, — von der. Cztg. Opt.* 7 (1888) 181-.
- error in Edwards's position for eye-stop. *Hornblower, J. C. Nicholson J.* 6 (1808) 247-.
- field of view. *Cox, J. D. (xii) Am. Mer. J.* 8 (1882) 61-.
- focal point, intensity. *Walker, J. Ph. Mg.* 33 (1892) 266-.
- focus. *Peaucellier, —. N. A. Mth.* 20 (1861) 427-.
- focusing of photographic, method. *Meslin, G. J. de Ps.* 9 (1900) 280-.

## GALILEO'S TELESCOPE.

- Kurz, A. Exner Rpm.* 19 (1883) 337-, 822.
- field of view. *Bohn, C. Carl Rpm.* 9 (1873) 97-.
- — — — — *Lubimoff, N. Les Mondes* 31 (1873) 162-.
- — — — — *Czapski, S. Z. Instk.* 7 (1887) 409-; 8 (1888) 102.
- — — — — *Farkas, G. Orv.-Termt. Éts. (Termt. Szak)* (1887) 273-, 363-.
- as surveying instrument. *Humbert, G. C. R.* 128 (1899) 819-.
- theory. *Bravais, A. A. C.* 33 (1851) 494-.
- — — — — *Pechaidl, W. Carl Rpm.* 18 (1882) 686-; 19 (1883) 413-.
- — — — — *Quemeville, G. Mon. Sc.* 14 (1900) 573-.
- Gauss's theory. *Bravais, A. Liouv. J. Mth.* 1 (1856) 51-.
- giant. *Kaempfer, D. [1894-98] Braunschw. Vr. Nt. Jbr.* (9) (1903) 31-; (11) (1899) 137-.
- — — — — American. *Ranyard, A. C. Ciel et Terre* 14 (1893-94) 557-.
- without glass, in antiquity and in middle ages. *Günther, S. Bb. Mth.* (1894) 15-.
- great Paris. *Lockyer, N. [1899] Nt.* 61 (1899-1900) 178-.
- — — — — results to be expected. *Grubb, (Sir) H. [1899] Dubl. S. Sc. P.* 9 (1899-1902) 55.
- history. *Schröder, H. Cztg. Opt.* 20 (1899) 143-, 161-, 171-, 182-, 193-, 201-, 212-, 223-, 232-; 21 (1900) 11-, 22-, 31-, 41-, 51-, 64-, 71-, 81-, 91-, 101-, 122-, 142-, 151-, 172-, 181-, 191-, 201-, 211-, 221-, 231-.
- Huygens's. *Jadanza, N. Tor. Ac. Sc. Mm.* 46 (1896) 253-.
- — — — — field of view. *Bolt, J. C. [1891] Mbl. Nt.* (1891-92) 42-.
- improvements. *Marx, C. M. Schweigger J.* 58 (= *Jb.* 28) (1830) 166-; 60 (= *Jb.* 30) (1830) 60-, 173-.

## Objectives 3080

- improvements. *Ginsberg, A. Par. S. Pa. Sé.* (1897) 44\*.
- magnifying power, determination. *Dufour, C. Arch. Sc. Ps. Nt.* 30 (1893) 315-.
- — — — — (Dufour). *Gariel, —. Arch. Sc. Ps. Nt.* 30 (1893) 352-.
- — — — — by microscope. *Goring, C. R. QJ. Sc.* 17 (1824) 367-.
- — — — — simple. *Varley, S. Tilloch Ph. Mg.* 4 (1799) 87-.
- — — — — *Jacquin, J. von. Baumgartner Z.* 2 (1833) 101-.
- — — — — and field of view. *Lubimoff, N. [1872] Mosc. Bll. S. Nt.* 45 (pt. 2) (1873) 1-.
- — — — — — — — — — — (Lubimoff). *Bredichin, T. Mosc. Bll. S. Nt.* 45 (pt. 2) (1873) 380-; 46 (pt. 1) (1873) 460-; (xii) *Rec. Mth. (Moscou)* 6 (1872-73) (Pt. 1) 303-.
- — — — — — — — — — — (Bredichin). *Lubimoff, N. Mosc. Bll. S. Nt.* 46 (pt. 1) (1873) 165-.
- — — — — — — — — — — (Lubimoff). *Bredichin, T. Carl Rpm.* 10 (1874) 54-.
- — — — — — — — — — — and brightness. *Bohn, C. Z. Mth. Ps.* 29 (1884) 25-, 74-.
- — — — — — — — — — —, simple determination. *Waltenhofen, A. von. [1871] Prag Ab.* 5 (1872) 15 pp.
- — — — — — — — — — —, theorem. *Robinson, T. R. [1852] Ir. Ac. P.* 5 (1850-53) 249-.
- — — — — — — — — — —, useful. *Strehl, K. Cztg. Opt.* 18 (1897) 171.
- — — — — — — — — — — and visual angle, instrument for measuring. *Cavalleri, G. M. (vi Add.) Majocchi A. Fis. C.* 27 (1847) 281-.
- marine. *Steinheil, C. A. von. Münch. Sb.* 1 (1863) 468-.
- method of weakening sun's light at focus. *Foucault, [J. B.] L. C. B.* 63 (1866) 413-.
- micrometer adjustments, illumination. *Förster, W. (xii) Z. Instk.* 1 (1881) 7-, 119-.
- micrometers for. *Cavani, F. Mod. Ac. Sc. Mm.* 12 (1896) lxxxv-.
- mirror readings, form for. *Hartmann, E. Würzb. Ps. Md. Sb.* (1881) 45-.
- monochromatic, with application to photometry. *Rayleigh, (Lord). L. Ps. S. P.* 7 (1886) 90-; *Ph. Mg.* 19 (1885) 446-.
- non-magnifying. *Bohn, K. (xii) Z. Instk.* 2 (1882) 7-.
- notation for lenses. *Gariel, C. M. J. de Ps.* 7 (1878) 127-.

## OBJECTIVES.

- Moser, C. Z. Instk.* 7 (1887) 225-, 308-.
- Fowler, A. Nt.* 45 (1892) 204-.
- with aperture in form of scalene triangle, appearance of luminous point through. *Miller, W. H. Ph. Mg.* 15 (1839) 459-.
- aplanatic, 4 surfaces. *M'Laren, (Lord). Edinb. R. S. P.* 15 (1889) 355-.
- astronomical, calculation. *Harting, H. Z. Instk.* 19 (1899) 104-.
- auto-collimation. *Martin, Ad. C. R.* 91 (1880) 219-.
- distribution of light in non-central images. *Steinheil, A. Leip. As. Gs. Vjschr.* 24 (1889) 239, 254-; *Münch. Ak. Sb.* 19 (1890) 413-.

## 3080 Reflecting Telescopes

- double achromatic. *Harkness, W.* [1893-1900] *Am. J. Sc.* 9 (1900) 287-.
- cemented, theory. *Harting, H.* *Z. Instk.* 18 (1898) 357-.
- —, —. *Hbegeh, E. von.* *Z. Instk.* 19 (1899) 37-.
- with flint glass lenses. *Kapustin, P. I.* *Mosc. S. Sc. Bl.* 65 (No. 1) (1890) 90-; *Fachr. Ps.* (1890) (Ab. 2) 208.
- improved colour correction. *Wolf, M.* *Z. Instk.* 19 (1899) 1-.
- influence of want of sphericity on angular measurements. *Krüss, H.* *Z. Instk.* 12 (1892) 199-.
- large, testing. *Grubb, (Sir) H. B. A. Rp.* (1876) (Sect.) 36-.
- and mirrors, preparation and testing. *Grubb, (Sir) H.* [1896] *R. I. P.* 11 (1887) 413-.
- new support for. *Steinheil, R.* *Z. Instk.* 14 (1894) 170-.
- of several separated lenses. *Ferraris, G.* *Tor. Ac. Sc. At.* 16 (1880) 45-.
- for spectroscopic use. *Hastings, C. S.* *Am. J. Sc.* 7 (1899) 267-.
- theory. *Seidel, L.* *As. Nr.* 35 (1853) 301-.
- of zenith telescope, combination for. *Zahn, W. von.* [1880] *Leip. Nf. Gs. Sb.* 7 (1881) 24-.
- optical axis, determination. *Rosé, C.* *C. R.* 104 (1887) 1260-.
- effects of large and small. *André, C.* *As. Fr. C. R.* (1889) (Pt. 1) 254.
- illusion. *Lisleferme, H.* *J. de Ps.* 6 (1877) 339-.
- theory. *Jadanza, N.* *Tor. Ac. Sc. At.* 17 (1881) 714-; 19 (\*1883) 769-.
- panoramic. *Donders, F. C.* *Donders Ndl. Gast. Oogl. Vs.* 18 (1877) 51-; *Aroh. Néerl.* 18 (1878) 99-; *Donders Ndl. Gast. Oogl. Vs.* 18 (1877) 87-.
- panorhithic, with wide field. *Zachokke, P.* *Cztg. Opt.* 7 (1886) 1-.
- possibilities. *Biggs, A. B.* *Tasm. R. S. P.* (1891) 18-.

### REFLECTING TELESCOPES.

- Brewster, (Sir) D.* *Edinb. Ph. J.* 7 (1822) 323-; 8 (1823) 326-.
- Barfuss, F. W.* *As. Nr.* 15 (1838) 285-; 18 (1841) 197-.
- Cassegrain, with glass mirror, theory. *Groeben, — von den.* *Cztg. Opt.* 6 (1885) 147-.
- and Gregory, theory. *Macé de Lépinay, J.* *N. A. Mth.* 18 (1879) 258-.
- collimator for completing adjustments. *Stoney, G. J.* *B. A. Rp.* (1856) (pt. 2) 30-.
- improved equatorial. *Calver, G.* *Cztg. Opt.* 16 (1895) 121-, 133-.
- metallic alloys for. *Šafárik, A.* *Prag Sb.* (1893) (Mth.-Nt.) No. 84, 14 pp.; *Cztg. Opt.* 15 (1894) 207-, 217-, 229-, 241-, 253-, 265-.
- and mirrors. *Schröder, H.* *Cztg. Opt.* 19 (1898) 2-, 13-, 23-, 42-, 52-, 62-, 71-, 83-.
- mirrors, construction. *Schröder, H.* *Cztg. Opt.* 16 (1895) 37-, 50-; 17 (1896) 101-.
- and observatory, Bowdon. *Okell, S.* *Manch. Lt. Ph. S. Mm. & P.* 3 (1890) 212-.

## Refracting Telescopes 3080

- and refracting telescopes. *Herschel, (Sir) J. F. W.* [1825] *QJ. Sc.* 20 (1826) 288-.
- — —, large. *Lockyer, W. J. S.* [1897] *Nt.* 57 (1897-98) 200-.
- shortening, method. *Burckhardt, J. C.* [1807] *Con. des Temps* (\*1809) 401-.
- — —, Burokhardt's. *Brewster, (Sir) D.* *Tilloch Ph. Mg.* 33 (1809) 290-.
- specula, annealing. *MacCulloch, J.* *QJ. Sc.* (1828) (Pt. 1) 255-.
- , casting. *Potter, R.* *Ph. Mg.* 36 (1850) 13-.
- , — and working, improvements. *Potter, R.* [1880] *Edinb. J. Sc.* 4 (1831) 13-.
- , composition and figuring. *Sollitt, J. D.* *B. A. Rp.* (1853) (pt. 2) 10.
- , effects of heat. *Fagnoli, G.* *Bologna Mm. Ac. Sc.* 2 (1850) 439-.
- , polishing. *Rosse, L. Parsons (Earl of).* *B. A. Rp.* (1864) 637-.
- use of metallic mirrors. *Schröder, H.* *Cztg. Opt.* 18 (1897) 71-, 82-, 92-, 104-, 112-, 124-, 132-.

### REFRACTING TELESCOPES.

- Brewster, (Sir) D.* *Tilloch Ph. Mg.* 33 (1809) 290-.
- Cazalet, —.* *J. de Ps.* 79 (1814) 233-.
- Hinks, A. R.* *Nt.* 62 (1900) 565.
- erecting or inverting at will. *Oppel, J. J.* (xii) *Frkt. a. M. Ps. Vr. Jbr.* (1863-64) 69-.
- history. *Voretzsch, M.* *Mt. Ostld.* 4 (1888) 117-.
- improved lens for large. *Schröder, H.* *Z. Instk.* 6 (1886) 41-.
- Lick Observatory, colour aberrations. *Strehl, K.* *Cztg. Opt.* 17 (1896) 3-, 14.
- and micrometric telescope. *Chevalier, C.* [1841] *As. S. M. Not.* 5 (1839-48) 111-.
- reticule illumination. *Czapski, S.* *Z. Instk.* 5 (1885) 347-.
- rock-crystal. *Cauchoz, —.* *Pogg. A.* 15 (1829) 244-.
- for sextants. *Plummer, W. E.* [1899] *Nt.* 61 (1899-1900) 54.
- shortened. *Jadanza, N.* *Tor. Ac. Sc. At.* 19 (\*1883) 769-.
- , *Steinheil, R.* *Z. Instk.* 12 (1892) 374-, 418-.
- , measurement of distance with. *Jadanza, N.* *Tor. Ac. Sc. At.* 30 (1895) 713-.
- shortening, method. *Jadanza, N.* *Tor. Ac. Sc. At.* 21 (1885) 119-.
- siderospectrographic. *Konkoly, N. von.* *Cztg. Opt.* 9 (1888) 25-.
- spectroscopic. *Zöllner, F.* *Leip. B.* 24 (1872) 129-.
- for stellar photography. *Grubb, (Sir) H.* *Nt.* 40 (1889) 441-, 645-.
- telescopic combination for gun sighting. *Schröder, H.* *Z. Instk.* 10 (1890) 133-.
- theory. *Piola, G.* *Mil. Effem. As.* (1822) 13-.
- , new. *Reade, J.* *Tilloch Ph. Mg.* 63 (1824) 20-.
- use on dark nights. *Rayleigh, (Lord).* [1882] *Camb. Ph. S. P.* 4 (1883) 197-.

### 3082 Microscopes

use of Porro prisms. *Bordé*, —. *Par. S. Ps.* 86. (1898) 68\*.  
 — of right-angled prism. *Steinhell*, A. *Leip. As. Gs. Vjschr.* 18 (1888) 255-.  
 with variable magnification. *Fritsch*, K. *Cztg. Opt.* 18 (1897) 1-, 11-, 21-, 163-.  
 — — — *Kaempfer*, D. *Braunsch. Vr. Nt. Jbr.* (10) (1897) 229-.  
 water-, for seeing mountains. *Adie*, J. *Edinb. N. Ph. J.* 49 (1850) 117-.  
 zenith-, photographic. *Marcuse*, A. *Berl. Strnw. Beob.-Ergebn.* No. 7 (1897) 6-.

#### FIELD-GLASSES.

adjustable to eyes of unequal focal lengths. *Malcolm*, (Col.) —. *L. Ps. S. P.* 7 (1886) 80-; *Ph. Mg.* 19 (1885) 461-.  
 astronomical, with large objectives. *Olivé*, R. *Rv. Sc. Ind.* 29 (1897) 132-.  
 capabilities. *Thompson*, R. E. [U. S.] *Chief Sig. Off. A. Rp.* (1889) (Pt. 1) 49-.  
 inventor. *Govi*, G. C. R. 91 (1890) 547-.  
 Krauss-Zeiss. *Coupe*, (l'abbé) —. *Brux. S. Sc. A.* 22 (1898) (Pt. 1) 17-.  
 marine, Merz's. *Perty*, M. *Bern Mt.* (1865) 139-.  
 Zeiss. *Nelson*, E. M. [1894] *Mer. S. J.* (1895) 360-.  
 — *Hermann*, —. *Königsb. Schr.* 36 (1895) [4]-.  
 — *Mack*, —. [1895] *Würtb. Jh.* 52 (1896) lxxxii-.  
 — *Schiff*, J. *Bresl. Schl. Gs. Jbr.* (1896) (Ab. 2a) 15-.

### 3082 Microscopes. (See also 3650; General Biology 0110; Anatomy 0140.)

*Koch*, —. (vi *Adds.*) *Halle Jbr. Nf. Gs.* (1824-25) 3-.  
*Jacquin*, J. von. *Baumgartner Z.* 5 (1829) 131-.  
*Carpenter*, T. *Gill Tech. Mor. Rep.* 6 (1830) 139-, 194-, 321-; 7 (1830) 1-.  
*Barfuss*, F. W. *As. Nr.* 20 (1843) 17-, 89-.  
*Grüel*, C. A. *Pogg. A.* 61 (1844) 220-.  
*Barfuss*, F. W. *Pogg. A.* 68 (1846) 88-.  
*Mercklin*, C. E. von. *Riga Arb. Nf. Vr.* 1 (1848) 83-.  
*Gaudin*, A. C. R. 30 (1850) 141-.  
*Burnett*, W. J. *Silliman J.* 12 (1851) 56-.  
*Alquen*, F. d'. *Rheinl. Westphal. Vh.* (1856) 87-.  
*Gibbons*, W. S. *J. Mer. Sc.* 4 (1856) 299-.  
*Reinicke*, F. *Al. D. Nt. Ztg.* 2 (1856) 470-.  
*Thury*, [J. M. A.] *Bb. Un. Arch.* 8 (1860) 283-.  
*Perty*, M. *Bern Mt.* (1862) 83-.  
*Porro*, I. *Mil. I. Lomb. Rd.* 3 (1866) 235-.  
*Dippel*, L. *Arch. Mkr. An.* 5 (1869) 281-; 9 (1873) 801-.  
*Abbe*, E. M. *Mer. J.* 14 (1875) 191-, 245-.  
*Crisp*, F. *Mer. S. J.* 1 (1878) 121-.

### Accessories. Camera Lucida 3082

*Anon.* *Mer. S. J.* 4 (1884) 281-.  
*Dippel*, L. *Humb.* 4 (1885) 273-, 306-, 356-.  
*Dallinger*, (Rev.) W. H. *Mer. S. J.* (1887) 185-.  
*Poli*, A. *Rv. Sc.-Ind.* 20 (1888) 137-, 169-, 190-; 21 (1889) 217-.  
*Darwin*, C. *Mer. S. J.* (1889) 454-.  
*Lamb*, J. M. *Am. S. Mer. P.* 13 (1891) 18-.  
*Dallinger*, (Rev.) W. H. [1893] *Quek. Mor. Cl. J.* 5 (1894) 210-.  
*Nelson*, E. M. [1894-96] *Quek. Mor. Cl. J.* 5 (1894) 348-; 6 (1897) 14-, 191-.  
*Michael*, A. D. *Mer. S. J.* (1897) 97-.  
*Tatham*, J. F. W. [1899-1900] *Quek. Mor. Cl. J.* 7 (1900) 180-, 299-.  
*Nelson*, E. M. *Mer. S. J.* (1900) 153-.

#### ACCESSORIES.

*Edwards*, A. M. *Mer. J.* 5 (1857) 110-.  
*Sorby*, H. C. *Mer. S. J.* 1 (1878) 1-.  
*Malassez*, L. *Par. S. Bl. Mm.* 41 (1889) (C. R.) 321-.  
 Anti-vibration turntray. *Bridgman*, W. K. [1876] *Quek. Mor. Cl. J.* 4 (1874-77) 209-.  
 Aplanatic searcher. *Royston-Pigott*, G. W. *Phil. Trans.* 160 (1870) 591-; *QJ. Mar. Sc.* 10 (1870) 393-; *M. Mer. J.* 11 (1874) 153-.

#### Camera Lucida.

*Nachet*, —. *J. Mer. Sc.* 8 (1860) 156-.  
*Crisp*, F. [1878] *Mer. S. J.* 2 (1879) 21-.  
*Russell*, J. C. [1878] *Mer. S. J.* 2 (1879) 25-.  
*Schröder*, H. *Mer. S. J.* 3 (1883) 813-.  
*Anthony*, J. *Mer. S. J.* 4 (1884) 697-.  
*Francotte*, P. [1884] *Brux. S. Blg. Mer. Bll.* 10 (1885) 77-.  
*Thoma*, R. *Z. Ws. Mkr.* 5 (1888) 297-.  
 Abbe's, improvements. *Giltay*, E. (xii) *Bt. Cb.* 12 (1882) 419-.  
 —, —. *Heinsius*, H. W. *Z. Ws. Mkr.* 6 (1889) 86-.  
 —, —. *Anon.* *Mer. S. J.* (1899) 93.  
*Ashe's*, *Scourfield*, D. J. *Quek. Mor. Cl. J.* 7 (1900) 418-.  
 binocular. *Edwards*, A. M. *Am. Mer. J.* 18 (1897) 256-.  
 of Doyère and Milne-Edwards, improvement. *Malassez*, L. *Par. S. Bl. Mm.* 36 (1884) (C. R.) 510-.  
 Dumaige's. *Anon.* *Mer. S. J.* (1888) 487-.  
 erecting. *Nelson*, E. M. [1894] *Mer. S. J.* (1895) 21-.  
 Hofmann's. *Heurck*, H. van. [1878] *Brux. S. Blg. Mer. Bll.* 5 (\*1879) lxvi-.  
 improved. *Ives*, F. E. *Mer. S. J.* (1896) 495.  
 — method of making measurements with. *Sendall*, (Sir) W. *Mer. S. J.* (1891) 705-.  
 and microscope, combination. *Weickert*, —. *Gilbert A.* 41 (1812) 110-.  
*Nachet's*. *Anon.* *Mer. S. J.* 6 (1886) 1057.  
 —. *Anon.* *Mer. S. J.* (1893) 99-.  
 theory and improvement. *Giltay*, E. [1888-84] *Ndl. Kruidk. Arch.* 4 (\*1886) 106-; *Z. Ws. Mkr.* 1 (1884) 1-.

- use. *Pettigrew, J. B.* *Manch. Mcr. S. T.* (1888) 80-.
- of microscope as. *Fayel, —.* *Par. S. Bl. Mm.* 38 (1886) (C. R.) 405-.
- in microscopic drawing. *Goethart, J. W. C.* [1892] *Ndl. Kruidk. Arch.* 6 (1895) 161-; *Z. Ws. Mkr.* 10 (1893) 466-.
- with variable angle. *Malassez, L.* *Par. S. Bl. Mm.* 37 (1885) (C. R.) 277-; *Par. Lb. Hl. Tr.* (1886-87) 7-.
- Zeiss's. Sykes, M. L.* *Manch. Mcr. S. T.* (1889) 106-.
- Centering glass, *Ross's. Anon. Mcr. S. J.* 6 (1886) 681-.
- Compressor. *Hislop, W.* [1856] *Mcr. S. T.* 5 (1857) 159-.
- *Clark, S. M.* *Silliman J.* 29 (1860) 448.
- *Monticelli, F. S.* *Z. Ws. Mkr.* 11 (1894) 454-.
- *Ziegler, H. E.* *Z. Ws. Mkr.* 14 (1897) 145-.
- , reversible, *Davis's ebonite. Anon. Mcr. S. J.* (1899) 337-.
- , *Macer's. Anon. Mcr. S. J.* (1898) 691-.
- Cover-glass gauge, *Beck's. Anon. Mcr. S. J.* (1900) 516.
- Cover-glasses, thin. *Jackson, G. J. Mcr. Sc.* 1 (1853) 141-.
- Diaphragms, dispersing. *Unna, P. G. Z. Ws. Mkr.* 3 (1886) 230.
- , graduated. *Coulter, —.* *Mm. Md. Mil.* 20 (1868) 328-.
- , iris, *Zeiss's. Zimmermann, A. Z. Ws. Mkr.* 4 (1887) 343-.
- , *Klönne and Müller's. Anon. Mcr. S. J.* 6 (1886) 680-.
- and mechanical finger. *Griffith, E. H. Am. S. Mcr. P.* (1885) 112-.
- , new ocular. *Lighton, W.* [1890] *Mcr. S. J.* (1891) 255-.
- , substage, *Griffith's. Anon. Mcr. S. J.* 6 (1886) 130.
- Diatomscope. *Osborne, (Lord) S. G. Mcr. S. J.* 4 (1884) 802-, 961.
- , *Osborne's. F., W.* [1884] *Mcr. S. J.* 5 (1885) 128-.
- , *Heurck, H. van.* [1884] *Mcr. S. J.* 5 (1885) 129.
- Drawing apparatus. *Bernhard, W. Z. Ws. Mkr.* 9 (1892) 439-.
- *Smith, A. H. Mcr. S. J.* (1892) 277-.
- , *Abbe's, modification. Bernhard, W. Z. Ws. Mkr.* 8 (1891) 291-.
- , construction and new model. *Czapki, S. Z. Ws. Mkr.* 11 (1894) 289-.
- for low powers. *Edinger, L. Z. Ws. Mkr.* 8 (1891) 179-.
- — — *Kaiser, O. Z. Ws. Mkr.* 13 (1896) 163-.
- — —, improved form of *Edinger's. Nelson, E. M. Mcr. S. J.* (1893) 101-.
- , micropantograph. *Roberts, I. M. Mcr. J.* 8 (1872) 1-.
- , microscopic geometric. *Hilgendorf, F. M. (xii) Z. Instk.* 2 (1882) 459-.
- , prism. *Anon. Mcr. S. J.* (1887) 650.
- Drawing apparatus, prism. *Piffard, H. G. Mcr. S. J.* (1892) 874-.
- , *Reichert's. Brauer, F. Z. Ws. Mkr.* 8 (1891) 451-.
- , *Winkel's. Henking, H. Z. Ws. Mkr.* 8 (1891) 295-.
- and dissection of objects, new arrangement for. *Brooke, C. B. A. Rp.* (1851) (pt. 2) 7.
- easel. *Giesenhagen, —. Z. Ws. Mkr.* 7 (1890) 169-.
- and measuring objects, apparatus. *Fick, A. Henle u. Pfeufer Z.* 3 (1853) 273-.
- , projection and photomicrography, *Reichert's combined apparatus. Anon. Mcr. S. J.* (1900) 122.
- Electric action, improved arrangement for observation. *Strübel, O. (xii) Z. Instk.* 2 (1882) 274-.
- Eye-shade. *Ward, R. H. Am. Mcr. J.* 5 (1884) 82-.
- *Hall, L. B. Science* 22 (1893) 94-.
- Finder. *Maltwood, T. Mcr. S. T.* 6 (1858) 59-.
- *Janson, H. U. J. Mcr. Sc.* 8 (1860) 199-.
- *Powell, T. Dubl. QJ. Md. Sc.* 38 (1864) 286-.
- *Flesch, M. H. J. Arch. Mkr. An.* 20 (1892) 502-.
- ("microstat" or "microtopograph"). *Smirnow, A. Arch. Mkr. An.* 29 (1887) 384-.
- *Valenti, A. Z. Ws. Mkr.* 10 (1893) 454-.
- *Stiles, J. H.* [1896] *Sc. Mcr. S. P. & T.* 2 (1900) 96.
- , geometrical. *Vescovi, P. de. Z. Az.* 15 (1892) 203-.
- , nose-piece. *Janson, H. U. Mcr. J.* 8 (1860) 269-.
- Finders. *Edwards, A. M. Mcr. J.* 5 (1857) 200-.
- and indicators. *Amyot, T. E. QJ. Mcr. Sc.* 4 (1856) 151-.
- , use. *Fabre-Domergue, P. Toul. S. H. Nt. Bl.* (1884) 148-.
- Illuminators.
- (See also Illumination.)
- Abbe, E. Arch. Mkr. An.* 9 (1873) 469-; *M. Mcr. J.* 13 (1875) 77-.
- Christy, T. S. C. In. J.* 7 (1868) 719.
- Reichert, —. Mcr. S. J.* (1893) 381-.
- Abbe's. Dippel, L. Flora* 56 (1873) 497-.
- , and apochromatic lenses. *Thankoffer, L. Termt. Közl.* 20 (1888) (Suppl.) 174-.
- , improved form. *Reichert, C. Czgt. Opt.* 18 (1897) 141-.
- , *Koristka's modification. Martinotti, G. Z. Ws. Mkr.* 2 (1885) 500-.
- , mechanical construction. *Behrens, W. Z. Ws. Mkr.* 1 (1884) 409-.
- , achromatic light-filter for high powers. *Eisen, G. Z. Ws. Mkr.* 14 (1897) 444-.
- , black shadow. *Royston-Pigott, G. W. M. Mcr. J.* 11 (1874) 246-.
- , cell. *Jacobs, F. O. Mcr. S. J.* (1890) 795.
- , concave mirror. *Ewell, M. D. Am. Mcr. S. P.* 14 (1892) 43.

## 3082 Illuminators

dark ground. *Nachet*, —. J. *Mer. Sc.* 8 (1860) 207-.

—, *Lighton, W.* [1878] (xii) *Am. Mer. J.* 1 [(1878-79)] 42-.

—, *Mayer, A. M.* *Mer. S. J.* 6 (1886) 514-.

—, *Nachet*, —. *Mer. S. J.* (1887) 463.

direct, Sorby's. *Anon.* *Mer. S. J.* 6 (1886) 130-.

glass-rod. *Maddox*, —. *Mer. S. J.* (1890) 101-.

immersion-. *Mayall, J.* *Mer. S. J.* 2 (1879) 27-.

—, catadioptric. *Stephenson, J. W.* *Mer. S. J.* 5 (1885) 207-.

—, —, Stephenson's. *Anon.* *Mer. S. J.* 5 (1885) 523.

—, catoptric. *Stephenson, J. W.* *Mer. S. J.* 2 (1879) 36-.

—, paraboloid. *Edmunds, J.* [1877] *Quek. Mer. Cl. J.* 5 (1878-79) 17-.

—, stage. *Mayall, J.* *Mer. S. J.* 2 (1879) 837-.

iris. *Ward, R. H.* *Am. S. Mer. P.* (1884) 160-.

method of adjusting. *Zimmermann, A. Z.* *Ws. Mkr.* 8 (1891) 454-.

monochromatic. *Nelson, E. M.* [1891] *Mer. S. J.* (1891) 443-; (1892) 1-.

—, Zeiss's. *Anon.* *Mer. S. J.* 6 (1886) 515.

paraboloid. *Edmunds, J. M.* *Mer. J.* 18 (1877) 78-.

—, *Wenham, F. H.* (xii) *Am. Mer. J.* 1 [(1878-79)] 186-; 1 (1880) 101-.

—, *Moore, A. J.* *Mer. S. J.* 4 (1884) 453-.

—, *Anon.* *Mer. S. J.* 4 (1884) 454.

prism, achromatic. *Edwards, A. M.* *N. Y. Lyceum P.* 1 (1873) 299-.

—, binocular, improved form of Stephenson's. *Ahrens, C. D.* *Mer. S. J.* 5 (1885) 959.

—, diatom, and true form of diatom markings. *Reade, J. B. M.* *Mer. J.* 2 (1869) 5-.

—, doubly reflecting. *Gray, P.* *Mer. J.* 1 (1861) 273-.

—, erecting. *Nachet*, —. J. *Mer. Sc.* 8 (1860) 206-.

—, *Nachet's*. *Shadbolt, G.* [1850] *Mer. S. T.* 3 (1852) 74-.

—, revolver immersion. *Edmunds, J.* *Mer. S. J.* 2 (1879) 32-.

reflex, for high powers. *Wenham, F. H. M.* *Mer. J.* 7 (1872) 237-.

simple. *Edwards, A. M.* *Mer. S. J.* (1893) 286-.

— (*Edwards*). *Maddox, R. L.* *Mer. S. J.* (1893) 423.

superstage. *Goodwin, W.* [1889] *Quek. Mer. Cl. J.* 4 (1892) 70-.

theory. *Fripp, H. E.* *Mer. S. J.* 2 (1879) 503-; 3 (1880) 742-.

on total reflection principle. *Kochs, W.* *Arch. Mkr. An.* 32 (1888) 683-.

for transparent objects. *Harting, P.* *Ndl. Lancet* 6 (1850-51) 457-.

traverse-lens. *Tolles, R. B.* *Mer. S. J.* 2 (1879) 388-.

universal reflecting. *Bridgman, W. K.* [1876] *Quek. Mer. Cl. J.* 4 (1874-77) 214-.

## Illuminators: Condensers 3082

vertical. *Stephenson, J. W.* *Mer. S. J.* 2 (1879) 266-.

—, *Forgan, W.* [1896] *Sc. Mer. S. P. & T.* 2 (1900) 56-.

—, diaphragm for Beck's. *Anon.* *Mer. S. J.* 5 (1885) 522-.

Wenham half-disk. *Dayton, R.* (xii) *Am. S. Mer. P.* (1882) 161-.

### Illuminators: Condensers.

*Bausch, E.* *Mer. S. J.* 4 (1884) 623.

*Wallich, G. C.* [1884] *Mer. S. J.* 5 (1885) 127-.

*Nelson, E. M.* *Mer. S. J.* 5 (1885) 327.

achromatic. *Curties, C. L.* *Mer. S. J.* (1900) 532.

—, Baker's. *Anon.* *Mer. S. J.* (1900) 512-.

—, Beck's. *Anon.* *Mer. S. J.* (1899) 338-.

—, and new method of illuminating opaque objects. *Riddell, J. L.* *Silliman J.* 15 (1853) 69.

annular. *Shadbolt, G.* [1850] *Mer. S. T.* 3 (1852) 132-.

apochromatic. *Mayall, J. (jun.)* *Mer. S. J.* (1889) 609.

—, Powell and Lealand's. *Anon.* *Mer. S. J.* (1889) 125-.

—, substage, with collar-correction. *Nelson, E. M.* *Mer. S. J.* (1895) 229-.

*Bausch and Lomb's*. *Anon.* *Mer. S. J.* (1887) 648.

bull's eye. *Nelson, E. M.* *Mer. S. J.* (1891) 309-.

—, doublet, new form. *Nelson, E. M.* *Mer. S. J.* (1896) 365-.

cone and immersion paraboloid. *Swift, J.* *Mer. S. J.* 5 (1885) 126-.

"desideratum." *Miles, J. L. W.* *Manch. Mer. S. T.* (1886) 81-.

with 2 diaphragm plates, Beck's. *Anon.* *Mer. S. J.* 4 (1884) 124.

homogeneous objective. *Lighton, W.* *Am. Mer. J.* 15 (1894) 59-.

improved. *Bridgman, W. K.* *Quek. Mer. Cl. J.* 4 (1874-77) 311-.

oil immersion, Beck's new wide-angle. *Anon.* *Mer. S. J.* (1900) 254.

—, equalising thickness of slips with. *Nelson, E. M.* [1885] *Mer. S. J.* 6 (1886) 131.

old Gillett, with collar adjustment. *Nelson, E. M.* *Mer. S. J.* (1899) 679.

*Reichert's*. *Moeller, J.* *Z. Ws. Mkr.* 2 (1885) 339-.

substage. *Leach, W.* *Manch. Mer. S. T.* (1888) 76-.

—, *Maddox, R. L.* [1889] *Mer. S. J.* (1890) 99-.

—, *Nelson, E. M.* [1890] *Quek. Mer. Cl. J.* 4 (1892) 116-.

—, *Hyatt*, —. *Mer. S. J.* (1891) 256-.

and substage, Bausch and Lomb's. *Anon.* *Mer. S. J.* (1887) 809.

substage and diaphragm. *Czapski, S.* *Z. Ws. Mkr.* 11 (1894) 433-.

—, Kellner eye-piece as. *Maddox, R. L.* *Mer. S. J.* 4 (1884) 801-.



3082 *Illuminators: Lamps*

substage, Swift's. *Anon.* *Mer. S. J.* (1900) 718-  
 —, Watson's. *Anon.* *Mer. S. J.* (1900) 119-  
 Wallich's. *Anon.* *Mer. S. J.* 4 (1884) 962-.

*Illuminators: Lamps.*

*Drosten, R.* *Brux. S. Blg. Mer. Bl.* 14 (1888) 171-  
*acme. Queen, J. W.* *Mer. S. J.* 6 (1886) 1053-  
 arc-, projection, Zeiss's. *Anon.* *Mer. S. J.* (1900) 381-  
*Baker's.* *Anon.* *Mer. S. J.* 6 (1886) 688.  
*Beck's complete.* *Anon.* *Mer. S. J.* 4 (1884) 628-  
 chimney for. *Nelson, E. M.* *Mer. S. J.* (1894) 108-  
 electric. *Flesch, M.* *Z. Ws. Mkr.* 1 (1884) 561-  
 —. *Poulsen, V. A.* [1884] *Kjøb. Bt. F. Mdd.* 1 (1882-86) 144-  
 — (Poulsen's). *Anon.* *Bt. Not.* (1885) 106-  
 —. *Barnard, J. E.* [1899] *Mer. S. J.* (1900) 118.  
 —. *Rousselet, C. F.* *Mer. S. J.* (1900) 741-  
 — incandescient. *Stearn, C. H.* *Mer. S. J.* 8 (1883) 29-  
 —. *Stein, T.* *Z. Ws. Mkr.* 1 (1884) 161-  
 — (Stein). *Heurck, H. van.* *Z. Ws. Mkr.* 1 (1884) 419-  
 —. *Anon.* *Mer. S. J.* 6 (1886) 1053.  
 —, Trouvé-Helot. *Mayall, J. (jun.)* *Mer. S. J.* 5 (1885) 1121-  
*Goodwin's.* *Nelson, E. M.* *Mer. S. J.* (1897) 90.  
 incandescent, Auer. *Bürkner, K.* *Z. Ws. Mkr.* 4 (1887) 85-  
 —, burning carburetted air. *Regnard, P.* *Par. S. Bl. Mm.* 34 (\*1882) (C. R.) 177-  
*Koch-Wolz.* *Schiefferdecker, P.* *Z. Ws. Mkr.* 7 (1890) 450-; 8 (1891) 53.  
 monochromatic. *Brewster, (Sir) D.* [1822] *Edinb. R. S. T.* 9 (1823) 433-  
*Nelson's.* *Anon.* *Mer. S. J.* 4 (1884) 125.  
 —, improved form. *Swift, J.* *Mer. S. J.* (1895) 393.  
*Nelson-Mayall.* *Mayall, J. (jun.)* *Mer. S. J.* 4 (1884) 286-  
 reflector. *Koch, W., & Wolz, M.* [1887] *Mer. S. J.* (1888) 1025-  
*Rühe's.* *Fricke, A. C.* *Ztg.* 9 (1885) 1388.  
*Schieck's.* *Anon.* *Mer. S. J.* (1888) 490-  
 shade. *Quimby, B. F.* *Mer. S. J.* (1887) 463.

*Immersion heating apparatus.* *Julien, A. A.* [1885] *Mer. S. J.* (1887) 466.  
*Inclining a preparation, instrument for.* *Jagger, T. A. (jun.)* *Am. J. Sc.* 3 (1897) 129-  
*Indicator.* *Bailey, J. W.* *Silliman J.* 20 (1855) 58-  
 —. *Schmidt, Ad.* *Halle Z. Nw.* 33 (1869) 465-  
 — for small objects. *Ballé, L.* *Rouen S. Sc. Bl.* (1894) 216-  
*Indicators.* *Pantocsek, J.* *Z. Ws. Mkr.* 5 (1888) 89-  
 —, focus-. *Griffith, E. H.* *Am. S. Mer. P.* 13 (1891) 47-  
*Lens- and slide-holder.* *Hippaley's.* *Anon.* *Mer. S. J.* 6 (1886) 129-.

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*Lieberkühn stops.* *Giles, G. W. M.* *Mer. S. J.* 6 (1886) 681.  
*Measuring apparatus.* *Lindau, G.* [1889] *Mer. S. J.* (1891) 252-  
 — — for small inequalities. *Sandberger, G.* *Pogg. A.* 85 (1852) 97-  
*Mechanical finger.* *Smith, H. L.* *Am. J. Sc.* 41 (1866) 331-  
*Micromegascopes.* *Matthews, J.* *Quek. Mer. Cl. J.* 5 (1878-79) 167-.

*Micrometers and Micrometry.*

*Harting, P.* *Hoeven en Vriese Ts.* 7 (1840) 165-  
*Jackson, G.* [1847] *Mer. S. T.* 2 (1849) 134-  
*Robertson, W.* *Edinb. M. J. Md. Sc.* 12 (1851) 329-  
*Jackson, G.* *J. Mer. Sc.* 4 (1856) 241-  
*Petruschefsky, F.* *Pogg. A.* 107 (1859) 633-  
*Burch, G. J.* [1878] *Quek. Mer. Cl. J.* 5 (1878-79) 45-  
*Baumann, T.* *Z. Instk.* 4 (1884) 149-  
*Love, E. G.* [1895] *Mer. S. J.* (1896) 245-  
*Berger, H.* *Z. Ws. Mkr.* 15 (1898) 303-  
 adjustment. *Förster, W.* (xii) *Z. Instk.* 1 (1881) 7-, 119-  
 best form. *Jackson, G.* *J. Mer. Sc.* 2 (1854) 129-  
 comparison and regulation. *Ettingshausen, A. von.* *Baumgartner Z.* 5 (1829) 316-  
 dynameter-, useful form (kratometer). *Royston-Pigott, G. W.* *M. Mer. J.* 5 (1871) 79-  
 measurements. *Ewell, M. D.* *Mer. S. J.* (1889) 447.  
 —, variation due to curvature of cover-glass. *Ewell, M. D.* *Am. S. Mer. P.* 12 (1890) 79-  
 —, — — focusing. *Hirsch, A.* *Par. Poids et Mes. PV.* (\*1877) 255-  
 —, — — —. *Bosscha, J.* *Delft Éc. Pol. A.* 2 (1886) 89-  
 —, — — — and inclination. *Foerster, W.* *Par. Poids et Mes. PV.* (\*1877) 269-  
 —, — — — different illumination. *Fasoldt, C.* *Mer. S. J.* (1888) 814.  
 new method. *Gibbons, W. S.* [1858] *Mer. S. T.* 7 (1859) 31-  
 —. *Matthews, J.* *Quek. Mer. Cl. J.* 1 (1868-69) 231-  
*Petruschewsky's.* *Knorr, E.* *Pogg. A.* 111 (1860) 125-  
 screw, differential. *Betz, G. W.* *Cztg. Opt.* 19 (1898) 181-  
 —, and glass micrometer eye-piece combined. *Koch, A.* *Z. Ws. Mkr.* 6 (1889) 33-  
 —, new arrangement. *Mohl, H. von.* *Arch. Mkr. An.* 1 (1865) 79-  
 —, — model. *Schiefferdecker, P.* *Z. Ws. Mkr.* 3 (1886) 1-  
 stage-, aërial. *Royston-Pigott, G. W.* [1872] *M. Mer. J.* 9 (1873) 2-, 51-  
 —, *Fasoldt.* *Mendenhall, T. C.* (xii) *Am. S. Mer. P.* (1882) 201-  
 —, 2 new forms. *Ewell, M. D.* *Am. S. Mer. P.* 12 (1890) 76-.



Dispersion. *Nelson, E. M.* *Mer. S. J.* (1899) 121-.

Elevations and depressions, discrimination. *Welcker, H.* *Henle u. Pfeufer Z.* 7 (1859) 63-.

Evolution of microscope. *Smolik, J.* *Živa* 9 (1861) 299-.

— — — *Blackham, G. E.* (xii) *Am. S. Mer. P.* (1882) 25-.

— — — *Lamb, J. M.* *Am. Mer. J.* 12 (1891) 273-.

— — — *Nelson, E. M.* [1897-98] *Quek. Mer. Cl. J.* 6 (1897) 349-; 7 (1900) 98-.

— — —, origin and uses. *Clinch, J. W.* [1896] *Yn Lioar Manninagh* 3 (1902) 49-.

Field of view, large, to obtain. *Forgan, W.* [1900] *Sc. Mer. S. P. & T.* 3 (1904) 32-.

## FINE ADJUSTMENT.

*Czapski, S.* *Z. Ws. Mkr.* 3 (1886) 207-.

*Anon.* *Mer. S. J.* 6 (1886) 686-.

*Griffith, E. H.* *Am. S. Mer. P.* 10 (1888) 161-.

(Watson's.) *Anon.* *Mer. S. J.* (1893) 93-.

*Marpmann, G.* *Z. Angew. Mkr.* 4 (1899) 86-.

*Stringer, E. B.* *Mer. S. J.* (1900) 419-.

cam. *Cutter, E.* *Mer. S. J.* 6 (1886) 1041-.

*Campbell's.* *Nelson, E. M.* *Mer. S. J.* 6 (1886) 324-.

and coarse, Ross's screw and pinion. *Anon.* *Mer. S. J.* (1889) 691-.

differential screw, Schröder's. *Anon.* *Mer. S. J.* 6 (1886) 685-.

double action, Anderson's. *Anon.* *Mer. S. J.* 6 (1886) 325.

evolution. *Nelson, E. M.* *Mer. S. J.* (1899) 366-.

hydrostatic. *Nelson, E. M.* [1884] *Quek. Mer. Cl. J.* 2 (1886) 57-.

"jewelled." *Mayall, J. (jun.)* *Mer. S. J.* (1890) 507-.

lever and parallel spring, Swift's. *Anon.* *Mer. S. J.* (1887) 808.

for substage. *Karop, G. C.* *Mer. S. J.* (1892) 421-.

tangent screw, Hilger's. *Anon.* *Mer. S. J.* (1887) 461.

Focus, means of changing. *Govi, G.* *C. R.* 84 (1877) 341-.

— — — *Anon.* *Mer. S. J.* 5 (1885) 1057.

— — — *Neuhauss, R.* *Mer. S. J.* (1888) 809.

— — — *Lucas, K.* *Mer. S. J.* (1899) 139-.

Focusing up or down too much, effect. *Maskell, W. M.* [1888] *Mer. S. J.* (1889) 134-.

Gavino's modification. *Trouessart, —, & Duplouch, —.* *Par. S. Bl. Mm.* 48 (1896) (C. R.) 1088-.

Glass, action of bleaching agents. *Whelpley, H. M.* *Mer. S. J.* (1889) 314.

—, cut lines in, optical appearance. *Slack, H. J. M.* *Mer. J.* 5 (1871) 213-.

— scales. *Nobert, F. A.* *As. Nr.* (1849) (*Ergänz. Heft*) 93-.

Hairs, visibility, etc. *Slack, H. J.* *Mer. S. J.* 1 (1878) 318-.

Heat-measurements. *Engelmann, T. W.* *Ndl. Arch. Ntk.* 3 (1868) 506-; *Arch. Mkr. An.* 4 (1868) 334-.

## ILLUMINATION.

(See also *Illuminators under Accessories.*)

*Brewster, (Sir) D.* [1831-40] *Edinb. J. Sc.* 6 (1832) 83-; *B. A. Rp.* (1840) (pt. 2) 9-.

*Bergin, T. F.* *Ir. Ac. P.* 5 (1853) 313-.

*Wenham, F. H.* *J. Mer. Sc.* 2 (1854) 145-.

*Higgins, J. F.* [1869] *QJ. Mer. Sc.* 10 (1870) 150-.

*Barker, J.* [1870] *Ir. Ac. P.* 1 (1873-74) 7-.

*Nelson, E. M.* [1884] *Mer. S. J.* 5 (1885) 713-.

*Tatham, J.* *Manch. Mer. S. T.* (1886) 78-.

by air-bubbles. *Brevoort, H. L.* [1885] *Mer. S. J.* 6 (1886) 324.

albo-carbon. *Malassez, L.* *Par. Lb. Hl. Tr.* (1886-87) 28-.

and aplanatic definition. *Royston-Pigott, G. W.* *M. Mer. J.* 4 (1870) 296-.

by artificial light. *Griffith, J. W.* *A. NH.* 12 (1843) 481.

— — — *Rainey, G.* [1853] *Mer. S. T.* 2 (1854) 23-.

— — — *Flesch, M. H. J.* *Würzb. Ps. Md. Sb.* (1882) 37-.

— — — and daylight. *Nelson, E. M.* *Mer. S. J.* 4 (1884) 621-.

— — —, with low powers. *Karop, G. C.* [1896] *Quek. Mer. Cl. J.* 6 (1897) 278-.

"canalisation" of electric light. *Tchikoleff, W.* *Lum. Élect.* 3 (\*1881) 132-, 151-, 184-.

centering the illuminating beam. *Queen, J. W.* *Mer. S. J.* 5 (1885) 524-.

central versus oblique light. *Nelson, E. M.* *Mer. S. J.* 6 (1886) 322-.

colour-. *Edwards, A. M.* *Am. Mer. J.* 16 (1895) 183-.

— *Rheinberg, J.* [1896-1900] *Quek. Mer. Cl. J.* 6 (1897) 346-, 438; *Mer. S. J.* (1899) 142-; *Am. Mer. J.* 21 (1900) 1-.

—, for stained preparations. *Flesch, M.* *Z. Ws. Mkr.* 3 (1886) 52.

dark-field. *Gebhardt, W.* *Z. Ws. Mkr.* 15 (1898) 289-.

by direct light. *Holmes, O. W.* *Am. Ac. P.* 2 (1848-52) 326-.

— — — *Selle, —.* *Fschr. Md.* 8 (1890) 775-, 814-.

direction, measurement. *Stuart, A.* [1870] *St. Pét. Ac. Sc. Bll.* 15 (1871) 517-.

by electric light. *Flesch, M.* *Z. Ws. Mkr.* 1 (1884) 175-.

under high powers. *Smith, Jas.* *Mer. S. J.* 3 (1880) 398-.

improvement. *Grubb, T.* *Ir. Ac. P.* 5 (1853) 296-.

by incandescent gas. *Arsonval, A. d'.* *Par. S. Bl. Mm.* 40 (1888) (C. R.) 170-.

lime light, portable form. *McIntosh, L. D.* *Am. S. Mer. P.* 13 (1891) 41-.

by monochromatic light. *Goring, C. R.* *Edinb. J. Sc.* 5 (1881) 52-.

- by monochromatic light (Goring). *Brewster*, (Sir) *D.* *Edinb. J. Sc.* 5 (1831) 143-.
- — — *Castracane degli Antelminelli*, *F.* *Rm. At.* 24 (1871) 106-.
- — — *Mayall*, —. *Mer. S. J.* (1891) 439.
- new method. *Castracane degli Antelminelli*, *F.* *QJ. Mer. Sc.* 5 (1865) 249-.
- oblique. *Reade*, *J. B.* *Sturgeon A. Electr.* 4 (1839-40) 407-.
- *Nachet*, —. *C. R.* 24 (1847) 976-.
- *Oberhaeuser*, *G.* *C. R.* 24 (1847) 1052-.
- *Middeldorpf*, *A.* *Bresl. Schl. Gs. Übs.* (1848) 87-.
- *Zeiss*, *C.* *Pogg. A.* 108 (1858) 654-.
- *Hilop*, *W.* [1868] *Quek. Mer. Cl. J.* 1 (1868-69) 64-.
- *Woodward*, *J. J.* (xii) *Am. Mer. J.* 1 [(1878-79)] 268-.
- *Gundlach*, *E.* (xii) *Am. Mer. J.* 3 (1882) 85-.
- *Nelson*, *E. M.* [1884] *Mer. S. J.* 5 (1885) 129, 131-.
- "F. R. M. S." [1884] *Mer. S. J.* 5 (1885) 130-, 132-.
- lateral displacement with. *Heschl*, —. *Pogg. A.* 105 (1858) 295-.
- — — *Place*, *F.* *Pogg. A.* 106 (1859) 641-; 107 (1859) 657-.
- and new sphæro-annular condenser. *Shadbolt*, *G.* [1851] *Mer. S. T.* 3 (1852) 154-.
- theory. *Töpler*, *A.* *A. Ps. C.* 127 (1866) 556-.
- for thin sections in polarised light. *Schroeder van der Kolk*, *J. L. C.* *Z. Ws. Mkr.* 8 (1891) 456-.
- of opaque objects. *Swaving*, *A. C.* *Haarl. Nrk. Vh. Mtsch.* 1 (pte. 1) (1799) 41-; *Holländ. Mg.* 1 (1802) 165-.
- — — *Bles*, *E. J.* [1884] *Manch. Mer. S. T.* (1884-85) 23-.
- — — *Anon.* *Mer. S. J.* (1887) 462.
- — — under high powers. *Brooke*, *C. B. A. Rp.* (1851) (pt. 2) 7.
- — — — *Wenham*, *F. H.* *Mer. S. T.* 4 (1856) 55-.
- — — — *Smith*, *H. L.* *Am. J. Sc.* 40 (1865) 238-.
- — — — *Morehouse*, *G. W.* *M. Mer. J.* 18 (1877) 29-.
- — — for projection microscope. *Fraser*, *P. (jun.)* *Am. Ph. S. P.* 18 (1880) 503-.
- — — or quasi-opaque. *Anthony*, *J.* *Mer. S. J.* 6 (1886) 857-.
- by polarised light. *Talbot*, *W. H. F.* *Ph. Mg.* 5 (1834) 321-.
- — — *Boeck*, *C.* *Sk. Nf. F.* 1 (1839) 107-; 2 (1840) 303-.
- — — *King*, *J.* [1846] *Mer. S. T.* 2 (1849) 81-.
- — — *Legg*, *M. S.* [1846] *Mer. S. T.* 2 (1849) 83-, 122.
- — — *White*, *M. C.* *Silliman J.* 26 (1858) 391-.
- — — *Dippel*, *L.* *Z. Ws. Mkr.* 1 (1884) 210-.
- by polarised light: examination of rock sections. *Quinn*, *E. P.* *Manch. Mer. S. T.* (1887) 60-.
- principles, in connection with polarisation. *Bridgman*, *W. K.* [1876] *Quek. Mer. Cl. J.* 4 (1874-77) 171-.
- problems. *Schröder*, *H.* *Catzg. Opt.* 20 (1899) 11-, 21-, 31-, 42-, 51-, 62.
- regulator. *Dancer*, *J. B.* [1864] *Manch. Lt. Ph. S. P.* 4 (1865) 34-.
- by single coloured light. *Köhler*, *A.* *Z. Ws. Mkr.* 16 (1899) 1-.
- in solar microscope by Drummond light. *Pfaff*, *C. H.* *Pogg. A.* 40 (1837) 547-.
- by striss method. *Töpler*, *A.* *A. Ps. C.* 127 (1866) 556-.
- — — *Töpler's. Seibert*, *W. K.* (xii) *Z. Instk.* 2 (1882) 92-.
- — — — *Wood*, *R. W.* *L. Ps. S. P.* 17 (1901) 338-; *Ph. Mg.* 50 (1900) 347-.
- substage. *Matthews*, *J.* [1870] *Quek. Mer. Cl. J.* 2 (1871) 80-.
- *Miles*, *J. L. W.* *Manch. Mer. S. T.* (1888) 78-.
- transmitted, and diatom-valve. *Beck*, *R.* *Intell. Obs.* 7 (1865) 93-.
- of transparent objects. *Rainey*, *G. J.* *Mer. Sc.* 2 (1854) 7-, 65-.
- — — new principle. *Wenham*, *F. H.* [1850] *Mer. S. T.* 3 (1852) 83-.
- variation of power in lens systems of large aperture. *Bratuscheck*, *K.* *Z. Ws. Mkr.* 9 (1892) 145-.
- white ground. *Bate*, (*Surg.-Lt.-Col.*) —. *Mer. S. J.* (1893) 419.
- Illusion, optical. *Savi*, *P.* *Pisa N. G.* 3 (1822) 118-.
- — — slide: cracks in silica films. *Slack*, *H. J.* [1870] *M. Mer. J.* 5 (1871) 14-.
- Illusions, various. *Manoury*, *C.* *Cæen S. L. Bll.* 1 (1877) 219-.
- Illusive appearances. *Royston-Pigott*, *G. W.* *M. Mer. J.* 9 (1873) 112-.
- — of some transparent objects. *Beck*, *R.* *QJ. Mer. Sc.* 4 (1864) 2-.
- Importance of microscope in all branches of natural science. *Schleiden*, *M. J.* (xii) *Arch. Phm.* 87 (1844) 68-; 88 (1844) 291-.
- Improvements. *Deyl*, *J. van, & Deyl*, *H. van.* *Haarl. Vh.* 3 (1806) 133-.
- *Goring*, *C. R.* *Thomson A. Ph.* 13 (1819) 52-; *QJ. Sc.* 19 (1825) 132-.
- *Coddington*, *H.* *Camb. Ph. S. T.* 3 (1830) 421-.
- *Marx*, *C. M.* *Schweigger J.* 58 (=Jb. 28) (1830) 166-; 60 (=Jb. 30) (1830) 60-, 173-.
- *Thomas*, *E.* *Silliman J.* 19 (1831) 57-.
- *Listing*, *J. B.* *Gött. Nr.* (1869) 1-, 108-.
- (Listing's). *Hagen*, *H. A.* [1869] *M. Mer. J.* 8 (1870) 96-.
- *Hitchcock*, *R.* *Am. Mer. J.* 7 (1888) 190-.
- *Nelson*, *E. M.* *Mer. S. J.* (1887) 1072-.
- *Delage*, *Y.* *Arch. Z. Exp.* 10 (1892) i-.

### 3082 Magnifying Power

- Improvements. *H.*, *L. Mcr. S. J.* (1892) 859-  
 —. *Cowl.*, —. *Arch. An. Pl. (Pl. Ab.)* (1895)  
 553-  
 — in technique. *Piffard, H. G. Mcr. S. J.*  
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 Interference phenomena in convergent polarised  
 light, method. *Schroeder van der Kolk,*  
*J. L. C. Z. Ws. Mkr. 8* (1891) 459-  
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*Mcr. J. 5* (1871) 205-.

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*Castracane degli Antelminelli, F. M. Mcr. J. 5*  
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 —. *Sous, G.* [1878] *Bordeaux S. Sc. Mm. 3*  
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 —, theoretical. *Arndt, (Dr.)* —. *A. Ps. C.*  
 127 (1866) 455-; 128 (1866) 632-  
 determination. *Jacquin, J. von. Baumgartner*  
*Z. 4* (1828) 1-  
 —. *Ettingshausen, A. von. Baumgartner Z.*  
 5 (1829) 316-  
 —. *Weise, R. Halle Z. Nw. 39* (1872) 140-  
 increase by use of divergent system. *Balsamo, F.*  
*Nap. S. Nt. Bil. 10* (1897) 20-  
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*A. Ps. C. (Jubelbd.)* (1874) 557-  
 —. *Krüss, A. H.* [1879] *Hamb. Nt. Vr.*  
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 —. *König, W. Frkf. a. M. Ps. Vr. Jbr.*  
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 —, calculable. *Czapski, S. Z. Ws. Mkr. 8*  
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 —, relation to molecular magnitudes. *Sorby,*  
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 megameter for measuring. *Govi, G. N. Cim.*  
 17 (1868) 177-  
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 miniatures. *Royston-Pigott, G. W. M. Mcr.*  
*J. 8* (1872) 268-  
 — precision of micrometric measurements.  
*Foerster, W. Par. Poids et Mes. PV. (\*1878)*  
 225-  
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- Measurement and counting of objects. *Wright,*  
*A. E. Mcr. S. J.* (1897) 182-  
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 — by eyepiece micrometer and by camera  
 lucida. *Jackson, G. Mcr. J. 1* (1841) 11-  
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- Measurement in microscopical research. *Fran-*  
*cotte, P. Brux. S. Blg. Mcr. Bil. 22* (1896)  
 122-  
 — — —. *Walter, O. Z. Angew. Mkr. 3*  
 (1898) 7-  
 —; reductions of fractions of Paris line and  
 millimeter to micromillimeters. *Schmula,*  
 —. *Z. Angew. Mkr. 3* (1898) 261-, 321-  
 — of rulings on glass. *Morley, E. W.* [1876]  
*M. Mcr. J. 17* (1877) 187-  
 —, universal. *Cooke, M. C.* [1866] *Quek.*  
*Mcr. Cl. J. 1* (1868-69) 1-  
 — by viewing object with one eye and a scale  
 with the other. *Hayden, T. Dubl. QJ. Md.*  
*Sc. 19* (1855) 119-  
 Mechanism. *Nelson, E. M. Mcr. S. J.* (1898)  
 236-  
 Medium, high refractive. *Smith, H. L. Mcr.*  
*S. J. 6* (1886) 901-  
 —, —. *Thompson, —.* [1892] *Quek. Mcr.*  
*Cl. J. 5* (1894) 123.  
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*Mcr. S. T. 2* (1849) 131-  
 Microcrystallography. *James, F. L. Mcr. S.*  
*J.* (1887) 1064-  
 —. *White, T. C. Mcr. S. J.* (1898) 270-  
 Micro-ruling, examination of slides. *Nelson,*  
*E. M.* [1894] *Mcr. S. J.* (1895) 134-  
 — on glass and steel, instrument for. *Stani-*  
*street, J. F. M. Mcr. J. 6* (1871) 274-  
 — — — — by Stanistreet. *Slack, H. J.*  
*M. Mcr. J. 6* (1871) 151-.

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- achromatic. *Thomas, E. Silliman J.* 20 (1831)  
 265-  
 —. *Oberhaeuser, G., & Trécourt, —. C. R.*  
 9 (1839) 322-  
 —. *Amici, G. B.* [1841-44] *Mcr. S. J.* (1900)  
 627-; *A. C. 12* (1844) 117-  
 —. *Brooke, C. R. I. P. 1* (1851-54) 402-  
 —. *Carpenter, W. B. (xii) Am. Mcr. J. 3*  
 (1882) 203-  
 —, Selligie's. *Fresnel, A. J. A. Sc. Nt. 3*  
 (1824) 345.  
 —, Spencer's. *Gilman, C. R. Silliman J. 5*  
 (1848) 237-  
 —, and tests. *Goring, C. R. QJ. Sc.* (1827)  
 (Pt. 1) 410-  
 aluminium. *Karop, G. C. Mcr. S. J.* (1892)  
 904-  
 American (North). *Hagen, H. A. Arch.*  
*Mkr. An. 6* (1870) 205-  
 —. *Coz, C. F. Mcr. S. J.* (1888) 652-  
 —. *Drescher, W. A. E. Am. S. Mcr. P. 11*  
 (1889) 181-  
 —. *Bausch, H. Am. S. Mcr. P. 13* (1891)  
 116-  
 —. *Anon. Mcr. S. J.* (1899) 331-  
 —, early. *Seaman, W. H. Am. Mcr. S. P. 14*  
 (1892) 156.  
 — and European. *Detmers, H. J. Am. S. Mcr.*  
*P. 10* (1888) 149-  
 with amplifiers. *Anon. Mcr. S. J. 4* (1884)  
 607.  
 aplanatic, improved. *Düllinger, I. Pogg. A.*  
 17 (1829) 54-.

### 3082 Binocular Microscopes

- "Austrian," Reichert's. *Anon.* *Mer. S. J.* (1899) 432.  
 —, —. *Nelson, E. M.* *Mer. S. J.* (1899) 674-794.  
 Babuchin's. *Anon.* *Mer. S. J.* (1888) 687-794.  
 Baker's D.P.H. No. 1. *Anon.* *Mer. S. J.* (1899) 646-.  
 "Baugh," Reichert's. *Anon.* *Mer. S. J.* (1899) 644-.

#### Binocular Microscopes.

- Riddell, J. L.* *Am. As. P.* (1853) 16-.  
*Wheatstone, (Sir) C.* *Mer. S. T.* 1 (1853) 99-.  
*Nachet, —.* *J. Mer. Sc.* 2 (1854) 72-.  
*North, E. D.* *Silliman J.* 18 (1854) 61-.  
*Wenham, F. H.* *J. Mer. Sc.* 1 (1861) 109-.  
*Goltzsch, H.* *Carl Rpm.* 15 (1879) 653-; 18 (1882) 27-.  
*Bausch, E.* *Mer. S. J.* 4 (1884) 607-.  
*Nelson, E. M.* [1892-97] *Quek. Mer. Cl. J.* 5 (1894) 45-; *Mer. S. J.* (1897) 599-.  
*Berger, É.* *C. R.* 129 (1899) 821-; *Fr. S. Z. Bll.* 25 (1900) 70-.  
 of 17th century. *West, C. E.* *Am. S. Mer. P.* 12 (1890) 57-.  
 and defective objectives. *Anon.* *Mer. S. J.* (1888) 1025.  
 dissecting. *Van Dyck, F. C.* [1888] *Mer. S. J.* (1889) 275.  
 —. *Measures, J. W.* *Mer. S. J.* (1897) 599.  
 erecting. *Stephenson, J. W.* *M. Mer. J.* 4 (1870) 61-; 7 (1872) 167-; *Mer. S. J.* (1887) 802-.  
 for high powers. *Ahrens, C. D.* *M. Mer. J.* 5 (1871) 113-.  
 horizontal. *Drüner, L., & Braus, H.* *Z. Ws. Mkr.* 14 (1897) 5-.  
 images in. *Nelson, E. M.* *Mer. S. J.* 5 (1885) 1073-.  
 improved. *Claudet, A. B. A.* *Rp.* (1860) (pt. 2) 61-.  
 —. *Wenham, F. H.* *Mer. S. T.* 8 (1860) 154-.  
 large, designed by amateur. *Nelson, E. M.* *Mer. S. J.* (1898) 668-.  
 orthoscopic and pseudoscopic effects. *Abbe, E.* *Mer. S. J.* 1 (1881) 203-.  
 portable. *Rousselet, C.* [1887] *Quek. Mer. Cl. J.* 3 (1889) 175-.  
 special form. *Aubert, —.* *Pflüg. Arch. Pl.* 47 (1890) 341-.  
 spectrum-. *Crookes, W. R. S. P.* 17 (1869) 443-.  
 and stereoscopic magnifier, *Nachet's Carpenter, W. B.* (ix) *Mer. S. T.* 15 (1867) 105-.  
 Wenham's, possibility of adjustment to variable tube length. *Bisbee, T. D.* *Am. Mer. S. P.* 14 (1892) 57-.  
 —, use with high powers. *Gibbes, H.* *QJ. Mer. Sc.* 20 (1880) 318-.
- Brewster's.* *Nelson, E. M.* [1897] *Mer. S. J.* (1898) 123-.  
 catadioptric. *Amici, G. B.* *Mod. Mm. S. It.* 18 (1818) 107-.

### Dissecting Microscopes 3082

- catadioptric. *Tulley, W.* *QJ. Sc.* (1828) (Pt. 2) 193-.  
 — (Amici's). *Cuthbert, J.* *QJ. Sc.* (1829) (Pt. 1) 270-.  
 —. *Laidlay, J. W.* *Beng. J. As. S.* 3 (1834) 288-.  
 —. *Amici, G. B.* (vi *Adds.*) *Majocchi A. Fis. C.* 8 (1842) 33-.  
 —. *Cavalleri, G. M.* *Mil. G. I. Lomb.* 6 (1845) 506-.  
 cheap. *Frey, H.* *Arch. Mkr. An.* 1 (1865) 443-.  
 with compound microscope in place of eyepiece. *Lendl, A.* [1891] *Mth. Term. Éts.* 10 (1892) 43-; *Z. Ws. Mkr.* 8 (1891) 281-.  
 — constant magnifying power. *Jadanza, N.* *Tor. Ac. Sc. At.* 26 (1891) 539-.  
 "continental." *Nelson, E. M.* [1893] *Mer. S. J.* (1894) 139-.  
 —, Bausch and Lomb's. *Drescher, W. E.* *Am. Mer. S. P.* 16 (1894) 12-.  
 —, —. *Anon.* *Mer. S. J.* (1899) 831.  
 —, Beck's. *Anon.* *Mer. S. J.* (1892) 855-.  
 —, —. *Anon.* *Mer. S. J.* (1896) 116-.  
*Curties's.* *Nelson, E. M.* *Mer. S. J.* (1891) 847.  
 demonstration-, *Leitz's.* *Anon.* *Mer. S. J.* (1888) 794-.  
 —, —. *Anon.* *Mer. S. J.* (1900) 248-.  
 —, Winkel's. *Anon.* *Mer. S. J.* 5 (1885) 308.  
 dioptric, Amici's. *Jacquin, J. von.* *Baumgartner Z.* 7 (1880) 257-.  
 — aplanatic horizontal. *Brachet, A. C. R.* 72 (1871) 606.  
 —, universal. *Orsi, A. N. A. Sc. Nt.* 8 (1851) 483-.  
 for direct observation and photography. *Leiss, C. Z. Angew. Mkr.* 3 (1898) 89-.  
 direct vision. *Amyot, T. E.* *Mer. S. J.* 5 (1885) 1056-.

#### Dissecting Microscopes.

- Brücke, E.* *Wien. SB.* 7 (1851) 554-.  
*Barnes, C. R.* *Bt. Gs.* 9 & 10 (1884-85) 427-.  
*Beck, C.* *Mer. S. J.* (1895) 713-.  
 adjustable. *Bogue, —.* [1899] *Mer. S. J.* (1900) 248.  
*Bausch and Lomb's.* *Anon.* *Mer. S. J.* (1899) 79.  
 — — folding. *Anon.* *Mer. S. J.* (1899) 217.  
 with Brücke lens. *Anon.* *Mer. S. J.* 5 (1885) 319-.  
 erect-image, *Leitz's.* *Nelson, E. M.* *Mer. S. J.* (1900) 741.  
*French's.* *Anon.* *Mer. S. J.* 6 (1886) 126-.  
 improved "excelsior." *Anon.* *Mer. S. J.* (1899) 77, 79.  
 large, *Leitz's.* *Anon.* *Mer. S. J.* (1889) 275-.  
*Mayer's.* *Anon.* *Mer. S. J.* 6 (1886) 507.  
 pocket-, *Sayre's.* *Anon.* *Mer. S. J.* (1899) 334.  
 and table. *Anon.* *Mer. S. J.* (1900) 386-.  
*Winkel's.* *Behrens, W.* *Z. Ws. Mkr.* 10 (1893) 295-.  
*Zeiss's.* *Francotte, P.* *Brux. S. Blg. Mer. Bll.* 12 (1885) 79-.

- Zentmayer's. *Anon.* Am. Mcr. S. P. 14 (1892) 51-.
- double. *Deby, J.* Mcr. S. J. 5 (1885) 854-.
- , *Inostranzeff, —.* Mcr. S. J. 5 (1885) 1058.
- , *Gates, E.* Am. Mcr. J. 19 (1898) 189-.
- doublet, microscopic. *Wollaston, W. H.* [1828] Phil. Trans. (1829) 9-.
- , — (Wollaston). *Goring, C. R.* QJ. Sc. (1830) (Pt. 1) 248-.
- "eclipse," *Ross's.* *Anon.* Mcr. S. J. (1894) 507-.
- electric. *Gürtner, G.* Md. Jb. (1884) 217-.
- erecting. *Ahrens, C. D.* Mcr. S. J. (1888) 1020.
- , *Ahrens's.* *Anon.* Mcr. S. J. 4 (1884) 278-.
- , —. *Anon.* Mcr. S. J. (1900) 115.
- , *Pfeiffer's.* *Anon.* Mcr. S. J. (1900) 509.
- excursion- and pocket-. *Amerling, K.* (xii) *Lotos* 14 (1864) 13-.
- exhibition-. *Anon.* Mcr. S. J. (1900) 714-.
- with 1-27 in. eyepiece. *Baker, C.* Mcr. S. J. (1900) 410.
- , —, *Baker's.* *Anon.* Mcr. S. J. (1900) 510-.
- farmer's. *Nelson, E. M.* Mcr. S. J. (1894) 106-.
- with 4-footed tripod, *Swift's.* *Dallinger, —.* Mcr. S. J. (1894) 285-.
- "Fram." *Anon.* Mcr. S. J. (1898) 673-.
- Galileo's. *Govt, G.* Nap. Ac. At. 2 (1888) No. 1, 33 pp.
- giant, *Ahrens's.* *Anon.* Mcr. S. J. (1889) 273.
- with glass plate polariser and Abbe's condenser. *Leiss, C.* Z. Angew. Mkr. 3 (1898) 138-.
- graphological. *Vorce, C. M.* Mcr. S. J. (1891) 402-.
- Griffith's.* *Anon.* Am. Mcr. S. P. 14 (1892) 53-.
- Hartnack's.* *Anon.* Mcr. S. J. (1898) 347-.
- , for flesh inspection. *Anon.* Mcr. S. J. (1899) 216.
- high power and portable solar. *Harting, P.* Miquel Bll. (1889) 353-.
- horizontal. *Barnes, C. R.* Bt. Gz. 22 (1896) 55-.
- , *Barnes's.* *Anon.* Mcr. S. J. (1899) 77.
- van *Heurck's.* *Mayall, J. (jun.)* Mcr. S. J. (1891) 434-.
- , —, *Watson's* "grand model." *Anon.* Mcr. S. J. (1895) 97.
- interference-. *Sirks, J. L.* Fsch. Ps. (1893) (Ab. 2) 85-.
- (Sirks). *Pringsheim, E.* Berl. Ps. Gs. Vh. (1898) 152-; D. Ps. Gs. Vh. (1899) 104.
- "international," *Pillischer's.* *Anon.* Mcr. S. J. (1899) 77.
- inverted; new eyepiece micrometer, and new goniometer. *Smith, James L.* Silliman J. 14 (1852) 233-.
- iron, *Powell's* (1838-40). *Nelson, E. M.* Mcr. S. J. (1899) 209-, 336-.
- Japanese. *Anon.* Mcr. S. J. 4 (1884) 953-.
- Jaubert's.* *Anon.* Mcr. S. J. (1887) 632-.
- laboratory. *Stuart, A.* [1870] St. Pét. Ac. Sc. Bll. 15 (1871) 517-.
- large. *Martius, C. F. P. von.* Münch. Gelehrte Az. 31 (1850) 53-.
- with large field. *Dejerine, J.* Par. S. Bl. Mm. 47 (1895) (C. R.) 411-, 451.
- , —, *Nachet's.* *Gravis, A.* [1884] Brux. S. Blg. Mcr. Bll. 10 (1885) 194-.
- large, *Nelson and Curtius's.* *Anon.* Mcr. S. J. (1889) 800-.
- with large stage. *Giacomini, C.* [1883] Mcr. S. J. 5 (\*1885) 515-.
- , —, modification of *Giacomini's.* *Koristka, F.* Mcr. S. J. 6 (1886) 675-.
- Leitz's.* *Wildeman, É. de.* Brux. S. Blg. Mcr. Bll. 22 (1896) 74-.
- "London." *Anon.* Mcr. S. J. (1900) 715-.
- for microchemical analysis, *Chamot's.* *Anon.* [1899] Mcr. S. J. (1900) 106-.
- micrometer-. *Albertotti, G. (jun.)* [1882] Mcr. S. J. 4 (\*1884) 793-.
- , *Nobert's.* *Anon.* Mcr. S. J. (1890) 86-.
- micrometric, for horologists, *Golfarelli's.* *Anon.* Mcr. S. J. (1898) 101-.
- micropolariscope (ratio-). *Field, J. J.* Quek. Mcr. Cl. J. 1 (1868-69) 215-.
- , food examined by. *Winton, A. L.* [1899] Mcr. S. J. (1900) 118-.
- model, *Nachet's*, and form of objective. *Dippel, L.* Z. Ws. Mkr. 3 (1886) 457-.
- , *Watson's.* *Dallinger, W. H.* Mcr. S. J. (1894) 761.
- models, new. *Dippel, L.* Z. Ws. Mkr. 2 (1885) 37-.
- with modified Abbe condenser, *Reichert's.* *Anon.* Mcr. S. J. 4 (1884) 437-.
- multioocular. *Thury, M.* Mcr. S. J. (1887) 796-.
- Nachet's.* *Anon.* Mcr. S. J. (1892) 858-.
- new. *Lobd, E. G.* Mcr. S. J. 1 (1861) 175-.
- , *Ceselli, B.* Les Mondes 17 (1868) 59-.
- , *Abbe, —.* Jena. Sb. (1886) 107-.
- , *Heurck, H. von.* Mcr. S. J. (1891) 558-.
- , *Lendl, A.* Term. Közl. 24 (1892) (Suppl.) 29-.
- Sir Isaac Newton's, new construction. *Potter, R.* [1831] Edinb. J. Sc. 6 (1832) 61-.
- for 2 observers. *Logan, J. H.* Am. S. Mcr. P. (1885) 120-.
- observing at considerable distances. *Deschamps, A.* C. R. 130 (1900) 1176-.
- old, *Adams, 1771, Martin, 1776.* *Anon.* Mcr. S. J. (1899) 324-.
- , *Cuff, 1755.* *Nelson, E. M.* Mcr. S. J. (1898) 675-.
- , *Culpeper*, about 1800. *Henriev, J. F., & Mellor, C. C.* Am. S. Mcr. P. 10 (1888) 140-.
- , —, *Powell* (1841?) and *Hartnack* (1862?). *Nelson, E. M.* [1897] Mcr. S. J. (1898) 124-.
- , *Eustachio Divini, 1671.* *Saccardo, P. A.* Ven. I. At. (1890-91) 817-.
- *French.* *Nelson, E. M.* Mcr. S. J. (1898) 674-.
- , *Martin.* *Anon.* Mcr. S. J. (1899) 213-.
- , — and *Cary.* *Anon.* Mcr. S. J. (1899) 473-.
- , *Pistor and Schiek's.* *Ehrenberg, C. G.* Pogg. A. 24 (1832) 188-.

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- old, Plössl. *Nelson, E. M.* *Mer. S. J.* (1900) 269.  
 —, Powell, Ross and Smith. *Nelson, E. M.* *Mer. S. J.* (1900) 282-, 425-, 550-.  
 —, presented by Linnaeus to Bernard Jussieu in 1738. *Henrici, J. F.* *Am. S. Mer. P.* (1887) 214-.  
 —, Ross, 1842-43. *Anon.* *Mer. S. J.* (1899) 214-.  
 for opaque objects. *Hall, R.* Thomson A. Ph. 14 (1819) 107-.  
 — — —. *Fremont, C.* C. R. 121 (1895) 321-.  
 — — —, Le Chatelier's. *Pellin, P.* *As. Fr.* C. B. (1897) (Pt. 1) 197.  
 — — —, —. *Anon.* [1898] *Mer. S. J.* (1901) 81-.  
 — — —, Reichert's. *Rejtö, A.* *Z. Ws. Mkr.* 14 (1897) 1-.  
 oxyhydrogen-. *Göppert, H. R., & Purkinje, —.* *Froriep Not.* 6 (1838) 149-.  
 —. *Hughes, W. C.* *Mer. S. J.* (1889) 115-.  
 —, improvements. *Mason, R. G.* [1890] *Mer. S. J.* (1891) 89-.  
 —, Swift's. *Anon.* *Mer. S. J.* 4 (1884) 799-.  
 pancreatic. *Fischer, A.* *Mosc. S. Nt. Bl.* (1841) 125-.  
 "paragon," Swift-Wale. *Anon.* *Mer. S. J.* 6 (1886) 1043-.  
 patent. *Fasoldt, C.* *Mer. S. J.* (1889) 109-.  
 periscopic. *Wollaston, W. H.* *Phil. Trans.* (1812) 370-.  
 — (Wollaston). *Jones, W.* *Nicholson J.* 84 (1813) 100-.  
 perspective. *Burch, G. J.* *R. S. P.* 42 (1887) 49-.  
 "plantation." *Baker, C.* *Mer. S. J.* (1900) 410.  
 —, Baker's. *Anon.* *Mer. S. J.* (1900) 511-.  
 polarising. *Nodot, —.* *Par. S. Ps. Sé.* (1877) 69-.  
 —. *Dufet, H.* *Par. S. Ps. Sé.* (1886) 139-.  
 —, arrangement for investigation of organic substances. *Mohl, H. von.* *Pogg. A.* 108 (1859) 178-.  
 —, in crystallography. *Des Cloizeaux, A. A.* *Mines* 6 (1864) 557-.  
 —, improvement. *Brewster, (Sir) D. B. A.* *Rp.* (1840) (pt. 2) 10.  
 —, Reichert's. *Anon.* *Mer. S. J.* 4 (1884) 440.  
 —, — new. *Anon.* *Mer. S. J.* (1899) 432.  
 polymicroscope. *Lenhossék, J. von.* *Virch. Arch.* 70 (1877) 268-; *Mer. S. J.* (1888) 104-.

#### Portable Microscopes.

- Amici, G. B.* *Il Tempo* 1 (1858) 161-.  
*Anon.* *Mer. S. J.* 4 (1884) 437.  
*Anon.* *Mer. S. J.* 5 (1885) 700-.  
*Henneguy, —.* *Par. S. Bl. Mm.* 39 (1887) (C. R.) 103.  
*Sticker, G.* *Z. Ws. Mkr.* 14 (1897) 433-.  
 aluminium. *Swift, J. M.* *Mer. S. J.* (1895) 711.  
 — and brass. *Smith, R.* *Mer. S. J.* (1895) 711.  
 Beck's. *Anon.* *Mer. S. J.* 5 (1885) 115.  
 Chevalier's. *Anon.* *Mer. S. J.* 6 (1886) 122, 124.

### Projection Microscopes 3082

- field. *Anon.* *Mer. S. J.* (1900) 379.  
 hand. *Sedlacek, J.* *Wien Jb. Gl.* 7 (1856) 97-.  
 —. *Marpmann, G.* *Z. Angew. Mkr.* 3 (1898) 44-.  
 —, Nacet's. *Anon.* *Mer. S. J.* (1893) 97.  
 —, Reichert's. *Anon.* *Mer. S. J.* (1898) 381.  
 —, 3 small. *Nelson, E. M.* *Mer. S. J.* (1899) 643-.  
 Harris's. *Anon.* *Mer. S. J.* 4 (1884) 611-.  
 improvements. *Warrington, R.* *Mer. S. T.* 7 (1859) 58-.  
 Leitz's. *Curties, C. L.* *Mer. S. J.* (1899) 678.  
 —. *Anon.* *Mer. S. J.* (1900) 108.  
 Nacet's. *Francotte, —.* *Brux. S. Blg. Mer. Bl.* 12 (1885) 60-.  
 —. *Hill, E. E.* *Mer. S. J.* (1895) 359-.  
 Nelson's. *Anon.* *Mer. S. J.* (1887) 1013-.  
 pocket. *Klein, L.* *Z. Ws. Mkr.* 5 (1888) 196-.  
 —, Adams's compendious. *Anon.* *Mer. S. J.* (1899) 532-.  
 —, Klönne and Müller's. *Anon.* *Mer. S. J.* 5 (1885) 309.  
 —, Watson's. *Anon.* *Mer. S. J.* 6 (1886) 311.  
 Swift's. *Nelson, E. M.* [1895] *Mer. S. J.* (1896) 185.  
 —. *Siddons, (Lt.-Col.) H. G. F.* *Mer. S. J.* (1896) 486-.  
 —. *Anon.* *Mer. S. J.* (1900) 379-.  
 Zentmayer's. *Nelson, E. M.* *Mer. S. J.* (1895) 26-.

#### Projection Microscopes.

- Rutot, A.* *Brux. S. Blg. Mer. A.* 3 (\*1877) 17-.  
*Wright, L.* [1884] *Mer. S. J.* 5 (1885) 196-.  
*Duboscq, T., & Duboscq, A.* *C. R.* 101 (1885) 476-.  
*Fayel, —.* *Par. S. Bl. Mm.* 38 (1886) (C. R.) 405-.  
*Quinn, E. P.* *Manch. Mer. S. T.* (1887) 26-.  
*Leach, W.* *Manch. Mer. S. T.* (1887) 52-.  
*Heger, R.* *Dresden Isis Sb.* (1888) 27-.  
*Hughes, W. C.* *Mer. S. J.* (1889) 116-.  
*Nelson, E. M.* *Mer. S. J.* (1891) 439-.  
*Furnivel, J. A.* [1891] *Mer. S. J.* (1892) 105-.  
*Fletcher, T.* [1891] *Mer. S. J.* (1892) 106-.  
*Salomons, (Sir) D. L.* *Mer. S. J.* (1893) 424-.  
*Greenwood, W.* *Manch. Mer. S. T.* (1894) 9-.  
 Adams's. *Mayall, J. (jun.)* *Mer. S. J.* (1888) 525.  
 attachment for oblique illumination or opaque objects. *McIntosh, L. D.* *Am. S. Mer. P.* 10 (1888) 155-.  
 Edinger's, Leitz's objectives for. *Anon.* *Mer. S. J.* (1900) 251-.  
 and electrical regulator for microscopic objects. *Behrens, W.* *Z. Ws. Mkr.* 16 (1899) 183-.  
 improved. *Wright, L.* *Mer. S. J.* (1899) 247-.  
 Leach's. *Anon.* *Mer. S. J.* (1889) 803-.  
 reflector with. *Buckton, G. B.* [1892] *Nt.* 47 (1892-93) 54-.  
 Reichert's. *Anon.* *Mer. S. J.* (1900) 120-.  
 —. *Anon.* *Mer. S. J.* (1900) 252-.  
 —. *Anon.* *Mer. S. J.* (1900) 258-.  
 Watson's. *Anon.* *Mer. S. J.* 5 (1885) 1064-.  
 Zeiss's. *Anon.* *Mer. S. J.* (1900) 383-.



- radial, Swift's. *Mayall, J. (jun.)* *Mer. S. J.* 6 (1886) 555-.
- reading- (Geneva Co.'s). *Anon.* *Mer. S. J.* (1887) 643.
- (Cambridge Scientific Instrument Co.'s). *Anon.* *Mer. S. J.* (1887) 643.
- , simplified. *Bohn, C. Z. Instk.* 4 (1884) 87-.
- reflecting. *Brewster, (Sir) D.* *Edinb. Ph. J.* 8 (1823) 326-.
- , *Guthrie, A.* *Edinb. N. Ph. J.* 20 (1836) 326-.
- , Amici's. *Cavalleri, G. M. (vi Add.)* *Majocchi A. Fis. C.* 8 (1842) 297-.
- , —, improvements. *Goring, C. R. QJ. Sc.* 21 (1826) 34-.
- , Brewster's, compared with Amici's catadioptric engscope. *Goring, C. R. Edinb. N. Ph. J.* 27 (1839) 31-.
- , improvements. *Doppler, C. Böhm. Gs. Ab.* 4 (1845-46) 91-.
- , refracting, and single, comparative merits. *Goring, C. R. QJ. Sc.* (1826) (Pt. 1) 107-.
- Reichert's No. VII b. *Anon.* *Mer. S. J.* (1893) 380-.
- with revolving foot, Mc Laren's. *Anon.* *Mer. S. J.* 4 (1884) 111-.
- stage. *Anon.* *Mer. S. J.* 5 (1885) 699-.
- revolving, with swinging tail-piece, Aylward's. *Anon.* *Mer. S. J.* 4 (1884) 110-.
- with screw stage micrometer, Schieok's. *Anon.* *Mer. S. J.* 5 (1885) 861.
- simple, and mechanical stage. *Wenham, F. H. Am. Mer. J.* 17 (1896) 143-.
- , Zeiss's. *Schacht, H. Bt. Ztg.* 10 (1852) 698-.
- with single lens, of diamond. *Pritchard, A. QJ. Sc.* (1827) (Pt. 2) 15-.
- — — — or sapphire. *Pritchard, A. Edinb. J. So.* 10 (1829) 327-.
- single, new construction. *Brewster, (Sir) D. Edinb. Ph. J.* 8 (1820) 74-.
- sliding, Leita-Nobelthau. *Anon.* *Mer. S. J.* (1900) 109-.
- solar. *Deschamps, A. C. B.* 130 (1900) 1175-.
- , aplanatic. *Carpenter, —. QJ. Sc.* (1828) (Pt. 2) 194-.
- , experiment. *Watson, Jas. Thomson A. Ph.* 14 (1819) 428-.
- and oxyhydrogen, production of achromatic light in. *Reade, (Rev.) J. B. (vi Add.) Ph. Mg.* 10 (1837) 184-.
- "star", Beck's. *Anon.* *Mer. S. J.* 5 (1885) 512-.
- , —. *Anon.* *Mer. S. J.* (1891) 806.
- stereoscopic. *Seibert, W.* [1876] *Giessen Oberh. Gs. B.* 16 (1877) 38-.
- dissection. *Schulze, F. E. Berl. Nf. Fr. Sb.* (1887) 146-.
- , Greenough's. *Czapski, S. Z. Ws. Mkr.* 14 (1897) 289-.
- , —. *Harting, H. Z. Ws. Mkr.* 15 (1898) 299-.
- , —, accessories. *Gebhardt, W. Z. Ws. Mkr.* 14 (1897) 304-.
- student's. *Nelson, E. M. Mer. S. J.* (1887) 292-.
- student's. *Seaman, W. H. Am. S. Mer. P.* 12 (1890) 67-.
- , Baker's. *Nelson, E. M. Mer. S. J.* (1891) 298.
- , Bausch and Lomb's. *Anon.* *Mer. S. J.* 6 (1886) 1037-.
- , Bulloch's. *Anon.* *Mer. S. J.* (1887) 140-.
- , instructions for making. *Swift, J. Mer. S. J.* (1894) 620-.
- , Swift's improved. *Karop, G. C. Mer. S. J.* (1891) 87-.
- , Watson's. *Anon.* *Mer. S. J.* (1899) 649.
- , — Edinburgh. *Nelson, E. M.* [1892] *Mer. S. J.* (1893) 95-.
- submersion. *Dudgeon, R. E. QJ. Mer. Sc.* 11 (1871) 239-.
- Swift-Wale. *Anon.* *Mer. S. J.* 5 (1885) 119-.
- swinging substage, Watson's. *Anon.* *Mer. S. J.* 5 (1885) 1062-.
- table. *Grubb, T.* [1858] *Dubl. R. S. J.* 3 (1860-62) 85-.
- trioocular, Ahrens's. *Anon.* *Mer. S. J.* (1887) 799-.
- universal. *Zenger, K. V. Prag Sb.* (1874) 131-.
- , *Braham, P. Mer. S. J.* (1890) 501-.
- , Russwurm's. *Anon.* *Mer. S. J.* (1899) 529-.
- Watson-Draper. *Anon.* *Mer. S. J.* (1887) 458-.
- Watson-Wale. *Anon.* *Mer. S. J.* 5 (1885) 860-.
- Winkel's. *Listing, J. B. A. Ps. C.* 142 (1871) 479-.
- Zeiss's X. *Anon.* *Mer. S. J.* 4 (1884) 954-.
- II a. *Anon.* *Mer. S. J.* (1886) 636-, 794.
- VI a. *Johne, —. D. Z. Thmd.* 20 (1894) 418-.
- , and 300 years history. *Martenson, J.* [1889] *Phm. Z. Russl.* 29 (1890) 145-, 161-, 177-, 193-, 224.
- Microscopic forms, investigation by means of images they furnish of external objects. *Rood, O. N. Silliman J.* 33 (1862) 65-.
- granules, motion. *Stodder, C. M. Mer. J.* 5 (1871) 81-.
- images with high powers, interpretation. *Nelson, E. M. Quek. Mer. Cl. J.* 2 (1886) 255-.
- , interpretation. *Cox, J. D. Mer. S. J.* (1891) 657-.
- , true and false. *Smith, T. F.* [1888] *Quek. Mer. Cl. J.* 3 (1889) 267-.
- , unusual. *Sohncke, L. Münch. Ak. Sb.* 23 (1894) 223-.
- objects, apparatus for exhibiting. *Flint, J. M. Am. S. Mer. P.* 13 (1891) 54-.
- optics, progress. *Duncan, P. M. Mer. S. J.* 2 (1882) 145-.
- physiology and physics, correlation. *Browning, J. M. Mer. J.* 2 (1869) 15-.
- Microspectrometer. *Engelmann, T. W.* [1888] *Utr. Oz.* 11 (1889) 39-; *Z. Ws. Mkr.* 5 (1888) 289-.
- Microspectrophotometer. *Engelmann, T. W.* [1893] (xii) *Amst. Ak. Wet. P.* (1883-84) (No. 6) 3-.

- Microspectroscope. *Browning, J. M.* *Mer. J.* 2 (1869) 65-.
- , *Mers, S.* *Carl Rpm.* 5 (1869) 390.
- , *Abbe, (Dr.) E.* *Jena. Z.* 5 (1870) 459-.
- , *Kraus, G.* *Erlang. Sb. Ps. Md. S.* 3 (1871) 62-.
- , *Gayer, E. J.* [1872] *M. Mer. J.* 9 (1878) 1-.
- , *Sorby, H. C.* *M. Mer. J.* 13 (1875) 198-.
- , *Abbe's Anon.* *Mer. S. J.* 4 (1884) 957-.
- , improvements. *Ward, F. H.* *Mer. S. J.* 1 (1878) 326-.
- , mapping with bright-line micrometer. *Bridge, H. C.* *M. Mer. J.* 6 (1871) 224-.
- , polarising. *Rollett, A.* (xii) *Z. Instk.* 1 (1881) 366-.
- , with telescope, and prism spectroscope. *Marpmann, G.* *Z. Angew. Mkr.* 5 (1900) 309-.
- Microspectroscopy. *Church, A. H.* *Intell. Obs.* 9 (1866) 291-.
- , *Hogg, J.* *M. Mer. J.* 2 (1869) 121-.
- Microstereoscopic vision. *Babo, C. H. L. von.* [1860] *Freiburg B.* 2 (1862) 812-.
- , *Moitessier, A.* [1865] *Mntp. Mm. Ac. Sect. Sc.* 6 (1864-66) (PV.) 48-.
- , *Abbe, E.* *Carl Rpm.* 17 (1881) 197-; *Mer. S. J.* 1 (1881) 690-.
- Microstereoscopy and new stereoscopic enlarging camera. *Drüner, L.* *Z. Ws. Mkr.* 17 (1900) 281-.
- Miniatured images. *Abbe, E.* *Mer. S. J.* 2 (1882) 693-.
- Misinterpretations. *Michels, J.* *M. Mer. J.* 14 (1875) 52-.
- Multiple images formed by eyes of insects. *Ersser, T. D.* [1895] *Mer. S. J.* (1896) 140.
- , in mirrors. *Stokes, W. B.* [1896] *Quek. Mar. Cl. J.* 6 (1897) 322-.
- Notations, optical. *Raugé, P.* *J. Mergr.* 16 (1892) 125-.

## OBJECTIVES.

- Johnson, A. S.* *Silliman J.* 13 (1852) 81-.
- Blackham, G. E.* *Mer. S. J.* 3 (1880) 515-.
- Anon.* *Mer. S. J.* 6 (1886) 316-.
- Burrill, T. J.* *Am. S. Mer. P.* 12 (1890) 35-.
- Castracane, (Conte) F.* *Rm. N. Linc. At.* 43 (1890) 215-.
- achromatic and apochromatic, Leitz's. *Anon.* *Mer. S. J.* (1900) 250-.
- , construction. *Marzoli, A.* *Brescia Cm.* (1808) 145-.
- , for engscopes. *Goring, C. R.* *Edinb. J. Sc.* 4 (1831) 244-.
- , history. *Casati, G.* *Brescia At. Cm.* (1891) 106-.
- , *Mayall, —.* *Brescia At. Cm.* (1891) 112-.
- , nomenclature. *Woodward, J. J.* *Am. J. Sc.* 3 (1872) 406-.
- , properties. *Lister, J. J.* *Phil. Trans.* (1830) 187-.
- actinic and visual foci, difference. *Johnson, G. J.* *Manch. Mer. S. T.* (1889) 108-.
- , —, —, —, *Turner, E. H.* *Manch. Mer. S. T.* (1890) 80-.

## Aperture.

- Wenham, F. H.* *J. Mer. So.* 2 (1854) 209-; 3 (1855) 180-.
- Sollitt, J. D.* *J. Mer. So.* 3 (1855) 239-.
- (*Wenham.*) *Bailey, J. W.* *J. Mer. So.* 4 (1856) 160-.
- Cavalleri, G. M.* *Mil. I. Lomb. Bd.* 2 (1865) 5-.
- Wenham, F. H.* *M. Mer. J.* 8 (1872) 231-.
- Woodward, J. J.* *M. Mer. J.* 9 (1873) 268-.
- Fripp, H. E.* (xii) *Bristol Nt. S. P.* 1 (1876) 441-.
- Wenham, F. H.* *M. Mer. J.* 15 (1876) 184-.
- Mayall, J.* *Mer. S. J.* 2 (1879) 184-.
- Cox, J. D.* (xii) *Am. Mer. J.* 3 (1882) 61-.
- Anon.* *Mer. S. J.* 5 (1885) 721-.
- Anon.* *Mer. S. J.* 5 (1885) 882-.
- angular. *Hendry, W.* *J. Mer. So.* 8 (1860) 61-.
- , *Tolles, R. B.* *M. Mer. J.* 6 (1871) 36-.
- , (*Tolles.*) *Wenham, F. H.* *M. Mer. J.* 6 (1871) 84-.
- , *Tolles, R. B.* *M. Mer. J.* 10 (1873) 58-.
- , *Wenham, F. H.* *M. Mer. J.* 11 (1874) 112-.
- , *Deby, J.* [1881] *Brux. S. Blg. Mer. Bl.* 7 (\*1883) xc- or lxxxix-.
- , *Cox, J. D.* *Am. S. Mer. P.* (1884) 5-.
- , of immersion objectives. *Tolles, R. B.* *M. Mer. J.* 6 (1871) 214-; 8 (1872) 108-.
- , —, —, determination. *Gundlach, E.* (xii) *Am. Mer. J.* 3 (1882) 176.
- , large. *North, E. D.* *Silliman J.* 17 (1864) 221-.
- , —, effect of cover-glass thickness on performance. *Keeley, F. J.* *Mer. S. J.* (1899) 437.
- , —, vision by. *Abbe, E.* [1862] *Mer. S. J.* 4 (\*1884) 20-.
- , measurement. *Robinson, T. R.* *Ir. Ac. P.* 6 (1853-54) 38-.
- , —, *Gillett, W. S.* [1854] *R. S. P.* 7 (1854-55) 18-.
- , —, *Stephenson, J. W.* *M. Mer. J.* 14 (1875) 3-.
- , —, *Hogg, J.* *M. Mer. J.* 15 (1876) 266-.
- , —, *Wenham, F. H.* *M. Mer. J.* 16 (1876) 285-; 18 (1877) 187-, 212-; 1 (1878) 321-; 2 (1879) 271-.
- , —, (*Wenham.*) *Keith, R.* *Mer. S. J.* 2 (1879) 270-.
- , —, by apertometer. *Woodward, J. J.* (xii) *Am. Mer. J.* 1 [(1878-79)] 272-.
- , —, —, *Abbe, E.* *Mer. S. J.* 3 (1880) 20-.
- , —, —, *Abbe's Zeiss, C.* [1877] *Mer. S. J.* 1 (1878) 19-.
- , —, —, *Nelson, E. M.* *Mer. S. J.* (1896) 592-.
- , —, slit. *Tolles, R. B.* [1874] *M. Mer. J.* 13 (1875) 21-.
- , —, —, *Keith, R.* *M. Mer. J.* 14 (1875) 284-.
- , and optical angle of crystals. *Lane, A. C.* *Science* 20 (1892) 354-.
- , relation to penetrating power and to oblique light. *Griffith, J. W.* [1864] *R. S. P.* 7 (1854-55) 60-.

- angular, relation to penetrating power and to oblique light (Griffith). *Alquen, F. d'*. J. Mcr. Sc. 3 (1855) 43-.
- , — surface markings, etc. *Slack, H. J.* M. Mcr. J. 13 (1875) 233-.
- , and universal apertometer. *Smith, H. L.* (xii) Am. Mcr. J. 1 [(1878-79)] 194-.
- , — (Smith). *Mayall, J. (jun.)* (xii) Am. Mcr. J. 1 [(1878-79)] 233-.
- , — working distance of objectives, measurement. *Blackham, G. E.* Am. S. Mcr. P. 11 (1899) 146-.
- comparison. *Rawlings, R. B. L.* Am. Mcr. J. 18 (1897) 3-.
- estimation. *Abbe, E.* Mcr. S. J. 1 (1881) 388-.
- , *Hockin, C. (jun.)* [1882] Mcr. S. J. 4 (\*1884) 337-.
- excessive, invisibility of small objects due to. *Royston-Pigott, G. W.* M. Mcr. J. 13 (1875) 55-.
- as factor in microscopic vision, experimental study. *Mercer, A. C.* Am. Mcr. S. T. 18 (1896) 321-.
- and focal length and working distance. *Gundlach, E.* (xii) Am. Mcr. J. 2 (1881) 82-.
- of immersion objectives, measurement. *Wenham, F. H.* M. Mcr. J. 10 (1873) 10-.
- large, efficacy. *Govi, G.* [1865] Tor. Mm. Ac. 23 (1866) 285-.
- measurement. *Wenham, F. H.* J. Mcr. Sc. 2 (1854) 134-.
- , *Robinson, T. R.* J. Mcr. Sc. 3 (1855) 163-.
- and microscopic vision. *Crisp, F.* Mcr. S. J. 1 (1881) 303-.
- numerical. *Stephenson, J. W.* Mcr. S. J. 1 (1878) 51-.
- , *Mayall, J.* Mcr. S. J. 2 (1879) 842-.
- , *Ewell, M. D.* Am. Mcr. S. P. 14 (1892) 44-.
- , and apertometers. *Kayser, E.* [1888] Danzig Schr. 7 (1888-91) (Heft 2) xiii-.
- , formula. *Dippel, L.* Z. Ws. Mkr. 1 (1884) 23-.
- , method of increasing. *Piffard, —.* Mcr. S. J. (1894) 518-.
- , in relation to air, water and balsam, tables. *Detmers, H. J.* Am. S. Mcr. P. (1885) 199-.
- , table. *Stephenson, J. W.* Mcr. S. J. 2 (1879) 339-.
- and power, relation. *Abbe, E.* Mcr. S. J. 2 (1882) 300-, 460-; 3 (1883) 790-.
- , —, *Blackham, G. E.* (xii) Am. S. Mcr. P. (1883) 33-.
- reduced. *Brakey, S. L.* M. Mcr. J. 9 (1873) 108-.
- in relation to objects in Canada balsam. *Wenham, F. H.* J. Mcr. Sc. 3 (1855) 302-.
- and resolution, relations. *Wright, L.* Mcr. S. J. 4 (1884) 299-.
- significant angle. *Van Dyck, F. C.* (xii) Am. Mcr. J. 3 (1882) 154-.
- small, calculation. *Harting, H.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 624-; Z. Instk. 18 (1898) 331-.
- theoretical limit. *Stokes, G. G.* Mcr. S. J. 1 (1878) 139-.
- aplanatic, for diverging rays. *Goring, C. R.* QJ. Sc. 22 (1827) 265-; (1827) (Pt. 2) 248-.
- , — (Goring). *Chevalier, C.* Edinb. J. Sc. 5 (1831) 233-.
- , — (Chevalier). *Goring, C. R.* Edinb. J. Sc. 5 (1831) 238-.
- apochromatic. *Gundlach, E.* [1887] Mcr. S. J. (1888) 285-.
- , *Heurck, H. van.* Brux. S. Blg. Mcr. A. 23 (1898) 41-.
- , and compensation eye-pieces, *Koristka's.* *Poli, A.* Rv. Sc. Ind. 20 (1888) 274-.
- , —, *Reichert's.* *Dippel, L.* Z. Ws. Mkr. 5 (1888) 148-.
- , —, *Zeiss's.* *Dippel, L.* Z. Ws. Mkr. 3 (1886) 303-.
- , —, —, *Czapski, S.* Z. Ws. Mkr. 5 (1888) 150-.
- , early form. *Mayall, J. (jun.)* Mcr. S. J. (1890) 420-.
- , fluorite in. *Nelson, E. M.* [1892] Quek. Mcr. Cl. J. 5 (1894) 122-.
- , without fluorite. *Jourdain, P. E. B.* Mcr. S. J. (1898) 395-.
- , new. *Cox, J. D.* [1890] Mcr. S. J. (1891) 248-.
- , *Reichert's.* *Heurck, H. van.* Brux. S. Blg. Mcr. Bl. 14 (1888) 156-.
- , *Zeiss's.* *Ewell, M. D.* Mcr. S. J. (1887) 462-.
- , —, *Heurck, H. van.* Brux. S. Blg. Mcr. A. 13 (1890) 123-.
- , —  $\frac{1}{2}$  in., and method of detecting spurious diffraction images. *Nelson, E. M.* [1889] Quek. Mcr. Cl. J. 4 (1892) 55-.
- apparatus for quickly changing. *Schock, G.* Zür. Vjschr. 13 (1868) 395-.
- , —, —, *Zeiss's.* *Czapski, S.* Z. Ws. Mkr. 4 (1887) 293-.
- , —, —, —, *Anon.* Mcr. S. J. (1887) 646-.
- attachment, *Bulloch's.* *Anon.* Mcr. S. J. 4 (1884) 118-.
- back of, and condenser. *Nelson, E. M.* [1888] Mcr. S. J. (1889) 288-.
- care and use. *Wales, W.* Mcr. S. J. 5 (1885) 708-.
- centering. *Brewster, (Sir) D.* B. A. Rp. (1857) (pt. 2) 4-.
- , *Leroy, C. J. A.* C. R. 113 (1891) 639-.
- collar-adjustment as affected by change of eye-pieces. *Stokes, A. C.* [1894] Mcr. S. J. (1896) 127-.
- comparative studies. *Strehl, K.* Z. Ws. Mkr. 17 (1900) 425-.
- construction. *Wenham, F. H.* M. Mcr. J. 1 (1869) 111-, 170-, 225-, 295-, 343-; 2 (1869) 93-.
- correction. *Wenham, F. H.* Quek. Mcr. Cl. J. 2 (1871) 21-.
- , primitive form. *Anon.* Mcr. S. J. (1899) 436-.
- cover-carrier for. *Wales, W.* [1886] Mcr. S. J. (1887) 296-.
- fluorspar lenses. *Spencer, H. R.* Am. S. Mcr. P. 12 (1890) 248-.
- focal length. *Cross, C. R.* Franklin I. J. 59 (1870) 401-.

## 3082 Immersion Objectives

- focal length of 3.9 mm. *Kerber, A.* Cstg. Opt. 11 (1890) 73-, 86-.
- , accurate photographic method of determining. *Legros, V.* C. R. 130 (1900) 270-.
- , determination. *Francotte, P.* Brux. S. Blg. Mer. Bl. 21 (1894) 208-.
- , —, —, *Franklin, W. S.* Ps. Rv. 1 (1894) 142-.
- , —, and magnifying power. *Royston-Pigott, G. W.* Quek. Mer. Cl. J. 3 (1873) 34-.
- , —, —, optical rule for. *Nelson, E. M.* [1895] Quek. Mer. Cl. J. 6 (1897) 208-.
- , differences between nominal and solar. *Royston-Pigott, G. W.* QJ. Mer. Sc. 12 (1872) 268-.
- and optical centre, determination. *Durand, W. F.* Am. Mer. J. 6 (1885) 141-.
- foci, and screen distances, determination. *Nelson, E. M.* Quek. Mer. Cl. J. 5 (1894) 456-.
- formula, new. *Wenham, F. H.* [1872] R. S. P. 21 (1873) 111-.
- Hartnaek's new. *Vogel, H. W.* Mer. S. J. (1888) 646.
- high power. *Beale, L. S.* R. S. P. 14 (1865) 35-.
- , *Arachnoidiscus* as test. *Smith, T. F.* [1888] Quek. Mer. Cl. J. 3 (1889) 247-.

## Immersion Objectives.

- Royston-Pigott, G. W.* M. Mer. J. 5 (1871) 65-; QJ. Mer. Sc. 12 (1872) 111-.
- Dippel, L.* Z. Ws. Mkr. 1 (1884) 485-.
- Gundlach, E.* Am. S. Mer. P. (1885) 51-.
- advantages; and use of deviation-tables. *Royston-Pigott, G. W.* M. Mer. J. 4 (1870) 20-, 134-.
- fluids for. *Stokes, A. C.* [1891] Mer. S. J. (1892) 261-.
- , refractive index. *Martinotti, G. Z.* Ws. Mkr. 3 (1886) 320-.
- homogeneous. *Stephenson, J. W.* Mer. S. J. 2 (1879) 266-.
- , correction. *Dippel, L.* (xii) Z. Instk. 2 (1882) 269-; Z. Ws. Mkr. 1 (1884) 29-.
- , and fluids of same refractive index. *Heurck, H. van.* [1881] Brux. S. Blg. Mer. Bl. 8 (\*1883) xxii-.
- , Hartnaek's. *Anon.* Mer. S. J. (1898) 351.
- , origin. *Abbe, E.* Mer. S. J. 1 (1881) 131-.
- , question of adjustability. *Blackham, G. E.* (xii) Am. S. Mer. P. (1881) 61-.
- , semi-apochromatic, Koristka's. *Amann, J.* Z. Ws. Mkr. 11 (1894) 145-.
- , Stephenson's. *Abbe, E.* Jena. Sb. (1879) 3-.
- large aperture. *Woodward, J. J.* M. Mer. J. 10 (1873) 210-.
- , —, *Keith, R.* M. Mer. J. 12 (1874) 124-.
- , —, *Stephenson, J. W.* Mer. S. J. 1 (1878) 51-.
- monobromonaphthalene. *Jackson, H.* Mer. S. J. (1889) 119.
- , *Czapski, S.* [1889] Mer. S. J. (1890) 11-.
- monobromonaphthalene, water, and oil. *Piffard, H. G.* Mer. S. J. (1894) 286-.
- , —, —, *Dallinger, W. H.* Mer. S. J. (1894) 413-.
- oil. *Heurck, H. van.* Brux. S. Blg. Mer. Bl. 4 (\*1878) cxcv-.
- , of Zeiss, compared with Spencer's objectives. *Smith, H. L.* [1878] (xii) Am. Mer. J. 1 [(1878-79)] 28-.
- and test-objects. *Mayall, J.* [1868] M. Mer. J. 1 (1869) 90-.
- theory. *Brakey, (Rev.) S. L.* M. Mer. J. 11 (1874) 221-, 249-.
- Tolles's  $\frac{1}{4}$ . *Bicknell, E. M.* Mer. J. 7 (1872) 70-.
- $\frac{1}{2}$  and Powell and Lealand's  $\frac{1}{4}$ . *Bicknell, E. M.* Mer. J. 8 (1872) 13-.
- , resolution of *Amphipleura pellucida*. *Woodward, J. J.* M. Mer. J. 6 (1871) 150-; 7 (1872) 165-.
- , —, —, — (Woodward). *Bicknell, E. M.* Mer. J. 6 (1871) 225-.
- imperfections and tests. *Royston-Pigott, G. W.* QJ. Mer. Sc. 10 (1870) 10-.
- improvements. *Spencer, C. A.* Silliman J. 13 (1852) 290-.
- , *Gundlach, E.* Am. S. Mer. P. (1884) 148-.
- with long focus, giving straight images. *Malassez, L.* Arch. Md. Exp. 1 (1889) 449-.
- low power. *Bockett, J.* [1867] Quek. Mer. Cl. J. 1 (1868-69) 16-.
- magnifying power. *Bullock, W. H.* Am. S. Mer. P. (1884) 183-.
- (of 1 in.). *M., W.* Am. Mer. J. 6 (1885) 203-.
- , —, *Tolman, H. L.* Am. Mer. J. 13 (1892) 93-.
- , measurement. *Marshall, W. P.* Midl. Ntlist. 10 (1887) 226-.
- , —, *Nelson, E. M.* Mer. S. J. (1887) 1032-.
- , standard of comparison. *Ingpen, J. E.* [1872] M. Mer. J. 8 (1872) 253-; Quek. Mer. Cl. J. 3 (1873) 97-.
- method of marking. *Krauss, W. C.* Am. Mer. S. T. 17 (1895) 359-.
- microspectral, with normal spectrum. *Engelmann, T. W.* Arch. An. Pl. (Pl. Ab.) (1900) (Suppl.) 338.
- modern. *Orford, H.* [1895] Mer. S. J. (1896) 241.
- new kinds of glass for. *Francotte, M. P.* Brux. S. Blg. Mer. Bl. 12 (1885) 100-.
- nomenclature. *Ward, R. H.* M. Mer. J. 8 (1872) 15-.
- , *Findley, G. M.* Mer. J. 8 (1872) 264-.
- penetration. *Davis, G. E.* Manch. Mer. S. Rp. (\*1883-84) 16-.
- Powell and Lealand's  $\frac{1}{4}$ . *Chalon, J.* [1885] Brux. S. Blg. Mer. Bl. 11 (1886) 196-.
- and their power. *Bicknell, E. M.* Mer. J. 7 (1872) 68-.
- refractive powers. *Tolles, R. B.* M. Mer. J. 7 (1872) 115-.
- resolution of *Amphipleura pellucida*. *Woodward, J. J.* M. Mer. J. 6 (1871) 150-; 7 (1872) 165-.

## Objectives 3082

### 3082 Microscopes

- semi-apochromatic. *Nelson, E. M.* [1899-97] *Mer. S. J.* (1890) 92-; (1897) 849.
- shade for. *Schwartz, Y. C.* *Ztg.* 12 (1898) 392.
- testing. *Webb, W.* [1872] *Quek. Mer. Cl. J.* 8 (1878) 118-.
- *Royston-Pigott, G. W. M.* *Mer. J.* 18 (1875) 147-; *Mer. S. J.* 3 (1880) 916-.
- *Nelson, E. M.* *Mer. S. J.* (1888) 816-.
- *Mayall, J. (jun.)* *Mer. S. J.* (1890) 842-.
- *Nelson, E. M.* *Mer. S. J.* (1896) 681.
- , Abbe's method. *Fripp, H. E.* [1877] (*xii*) *Bristol Nt. S. P.* 2 (1879) 8-.
- Tolles's †. *Tolles, R. B. M.* *Mer. J.* 12 (1874) 18-, 62-.
- *Keith, R.* *Mer. S. J.* 1 (1878) 142-; 2 (1879) 269.
- *Cutter, E.* *Am. Mer. J.* 16 (1895) 225-.
- universal screw for. *Bausch, E.* *Am. S. Mer. P.* (1884) 153-.
- Zeiss's*. *Dippel, L.* *Flora* 56 (1873) 497-.
- *Hickie, W. J. M.* *Mer. J.* 15 (1876) 185-.
- *Griffin, F. W. M.* *Mer. J.* 15 (1876) 242-.
- †. *Mayall, J. (jun.)* *Mer. S. J.* (1890) 832-.
- Oblique vision under highest powers. *Wenham, F. H. M.* *Mer. J.* 13 (1875) 156-.
- — — — —, Wenham's method, and Marshall's zoophyte trough. *Ingpen, J. E.* [1892] *Quek. Mer. Cl. J.* 5 (1894) 223-.
- Optical powers. *Rylands, T. G. J.* *Mer. Sc. J.* (1859) 27-.
- Patents, 1666-1800. *Brown, W. H.* *Mer. S. J.* (1895) 257-.
- Penetrating power. *Nelson, E. M.* *Mer. S. J.* (1892) 331-.
- Personal equation. *Ingpen, J. E.* [1874] *Quek. Mer. Cl. J.* 4 (1874-77) 17-.
- Philosophising in microscopy. *Jerwood, J.* *Devon. As. T.* 3 (1869) 135-.
- Prismatic observation of objects. *Huggins, W.* (*x*) *Mer. S. T.* 13 (1865) 85-.
- Process in technical microscopy. *Golgi, C.* *Mil. I. Lomb. Rd.* 12 (1879) 206-.
- Projecting micrometric scale on microscopic specimen, method. *Wright, A. E.* *Mer. S. J.* (1897) 245-.
- Receipts for microscopists. *Deby, J.* [1880] *Quek. Mer. Cl. J.* 6 (1879-81) 165-, 213.
- "Run" of microscope. *Förster, W.* *Leip. As. Gs. Vjschr.* 18 (1888) 228-.
- Salt crystals, preservation as permanent objects. *Warrington, R.* [1844] *C. S. Mm.* 2 (1848-45) 71-.
- Silica films, beaded. *Slack, H. J. M.* *Mer. J.* 11 (1874) 237-.
- Silicate cotton, Krupp's, microscopic aspects. *Slack, H. J. M.* *Mer. J.* 17 (1877) 236-.
- Silicon fluoride (? silica), crystals. *Anon.* *Mer. S. J.* (1887) 877-.
- Size of objects, determination. *Mohl, H. von.* *Linnæa* 16 (1842) 489-.

### Stages. Mechanical Stages 3082

#### STAGES.

- accessory. *Anon.* *Mer. S. J.* 5 (1885) 1058-.
- automatic mica, Edmonds's. *Anon.* *Mer. S. J.* (1888) 111-.
- capable of being heated. *Schlarowski, A.* *Arch. Mkr. An.* 4 (1868) 342-.
- combined focusing and safety-, for high powers. *Vorce, C. M.* *Am. S. Mer. P.* (1885) 115-.
- connected clips for. *Bolsius, (le rév. père)* — *Brux. S. Sc. A.* 17 (1893) (*Pt.* 1) 25-.
- differential. *Hildebrand, H. E.* *Z. Ws. Mkr.* 11 (1894) 304-.
- warm. *Bird, C. H. G.* *QJ. Mer. Sc.* 15 (1875) 372-.
- electrically heated. *Curties, C. L.* *Mer. S. J.* (1899) 354-.
- *Anon.* *Mer. S. J.* (1899) 438-.
- goniometer-, Hartnack's. *Anon.* *Mer. S. J.* 4 (1884) 960-.
- , Swift's. *Anon.* *Mer. S. J.* 4 (1884) 960.
- hand. *Hildebrand, H. E.* *Z. Ws. Mkr.* (1886) 386-.
- hot. *Macfadyen, A.* [1899] *Mer. S. J.* (1900) 110-.
- or cold. *Symons, W. H.* [1881] *Mer. S. J.* 2 (1882) 21-.
- improved, Bausch and Lomb's. *Anon.* *Mer. S. J.* (1899) 79-.
- indicator-. *Johnson, A. S.* *Silliman J.* 21 (1856) 386-.
- with iris diaphragm, Meyer's. *Behrens, W.* *Z. Ws. Mkr.* 12 (1895) 292-.
- lever movement. *White, A.* [1843] *Mer. S. T.* 1 (1844) 165-.
- Mechanical Stages.*
- Cramer, C.* *Z. Ws. Mkr.* 3 (1886) 5-.
- Nelson, E. M.* *Mer. S. J.* (1888) 477-.
- Bernard, H.* [1891] *Mer. S. J.* (1892) 166, 267-.
- Dallinger, —.* *Mer. S. J.* (1894) 537-.
- Nelson, E. M.* *Mer. S. J.* (1897) 185-.
- Baker's attachable. *Anon.* *Mer. S. J.* (1900) 512.
- Bausch and Lomb's. *Anon.* *Mer. S. J.* (1887) 650-.
- — — attachable. *Anon.* *Mer. S. J.* (1899) 334-.
- Brunée's. *Brauns, R.* *Z. Ws. Mkr.* 14 (1897) 11-.
- cam, Swift's. *Anon.* *Mer. S. J.* 6 (1886) 1052-.
- Klönne and Müller's. *Behrens, W.* *Z. Ws. Mkr.* 2 (1885) 502-.
- Mayall's. *Anon.* *Mer. S. J.* 5 (1885) 122.
- Nachet's. *Anon.* *Mer. S. J.* (1893) 97-.
- Reichert's. *Fleischl, E. von.* *Z. Ws. Mkr.* 2 (1885) 289-; 4 (1887) 25-.
- *Zimmermann, A.* *Z. Ws. Mkr.* 12 (1895) 433-.
- removable. *Curties, C. L.* *Mer. S. J.* (1899) 258.
- with vertical pinions. *Bulloch, W. H.* *Mer. S. J.* (1890) 795-.
- Winkel's. *Behrens, W.* *Z. Ws. Mkr.* 9 (1892) 433-.

### 3082 Stands

- Winkel's, for circular stages. *Behrens, W.* Z. Ws. Mkr. 10 (1893) 297-.
- for Zeiss stands. *Czapski, S.* Z. Ws. Mkr. 11 (1894) 301-.
- Zeiss's. *Measures*, —. *Mer. S. J.* (1894) 768.
- *Anon.* *Mer. S. J.* (1895) 97-.
- polarising. *Smith, James. J.* *Mer. Sc.* 8 (1860) 203-.
- revolving. *Taylor, T.* *Am. S. Mer. P.* 13 (1891) 189-.
- , mirror, etc., combined. *Éternod, A. Z.* *Ws. Mkr.* 4 (1887) 41-.
- secondary. *Hilop, W.* *Mer. S. T.* 6 (1858) 94-.
- selenite analysing. *Hilop, W.* *Quek. Mer. Cl. J.* 1 (1868-69) 225-.
- stage-plate, glass, with rectangular movements. *Cunningham, K. M.* *Am. Mer. J.* 19 (1898) 33-, 230.
- , Millar's multiple. *Anon.* *Mer. S. J.* 4 (1884) 120.
- , Stewart's safety-. *Anon.* *Mer. S. J.* 4 (1884) 120-.
- substage. *Nelson, E. M.* [1890] *Mer. S. J.* (1891) 257.
- , Bausch and Lomb's complete. *Anon.* *Mer. S. J.* (1899) 219-.
- , — — duplex. *Bausch, E.* [1900] *Mer. S. J.* (1901) 83-.
- fittings, standard sizes. *Nelson, E. M.* [1899] *Mer. S. J.* (1900) 141.
- , necessity. *Mayall, J. (jun.)* *Mer. S. J.* (1888) 1024-.
- table-. *Anon.* *Mer. S. J.* (1899) 355.
- warm. *Bartley, E. H.* (xii) *Am. Mer. J.* 1 (1880) 181-.
- *Malassez, L.* *Par. Lb. Hl. Tr.* (1896-87) 21-.
- and cold. *Dewitz, H.* *Arch. Mkr. An.* 30 (1887) 666-.
- — —. *Anon.* *Mer. S. J.* (1887) 299-.

### STANDS.

- Burrill, T. J.* *Am. S. Mer. P.* 11 (1889) 53-.
- Coutant, R. B.* *Mer. S. J.* (1894) 736-.
- Bausch, E.* [1898] *Mer. S. J.* (1899) 81-.
- with concentric movements. *Cox, J. D.* (xii) *Am. S. Mer. P.* (1883) 147-.
- continental form, development. *Dallinger, —.* *Mer. S. J.* (1893) 578-.
- —, —. *Nias, J. B.* *Mer. S. J.* (1898) 596-.
- dissecting-, and lens-carrier. *Siddons, (Lt.-Col.) H. G. F.* *Mer. S. J.* (1896) 679-.
- , Meyer's improved. *Anon.* *Mer. S. J.* (1899) 218-.
- graphological, small. *Ewell, M. D.* *Am. S. Mer. P.* 13 (1891) 69-.
- Günther's. Benda, C.* [1899] *Arch. An. Pl. (Pl. Ab.)* (1900) 179-.
- Leitz's. Nelson, E. M.* [1893] *Quek. Mer. Cl. J.* 5 (1894) 309-.
- and optical apparatus. ? *Marpmann, G. Z.* *Angew. Mkr.* 2 (1897) 290-, 321-, 351-.

### Testing. Nobert's Tests 3082

- Reichert's model large No. Ia. *Dippel, L.* Z. Ws. Mkr. 5 (1888) 145-.
- , with new stage and iris-diaphragm. *Anon.* *Mer. S. J.* 6 (1886) 307-.
- non-inclinable. *Anon.* *Mer. S. J.* (1899) 217, 647-.
- U-shaped. *Beall, W. J.* [1899] *Mer. S. J.* (1900) 114-.
- and tubes, etc. *Hildebrand, H. E.* Z. Ws. Mkr. 12 (1895) 145-.
- Zeiss's. *Czapski, S.* Z. Ws. Mkr. 4 (1887) 289-.
- , *Anon.* *Mer. S. J.* (1895) 225-.
- Zeiss-Babuchin. *Czapski, S.* Z. Ws. Mkr. 4 (1887) 290-.
- Zentmayer's American-Continental. *Anon.* *Am. Mer. S. P.* 14 (1892) 43-.

- Tercenary of microscope. *Mancini, E.* *N. Antol. Sc.* 114 (1890) 506-.
- — —. *Rutherford, W.* [1890] *Sc. Mer. S. P. & T.* 1 (1895) iv-.

### TESTING.

- Pohl, J. J.* *Wien SB.* 11 (1853) 504-.
- Amici's test. *Karop, G. C.* [1895] *Quek. Mer. Cl. J.* 6 (1897) 79-.
- Colour test. *Royston-Pigott, G. W.* *M. Mer. J.* 10 (1873) 61-.
- Efficiency and testing. *Reinicke, F. Al. D.* *Nt. Ztg.* 3 (1857) 416-.
- — —. *Nobert, F. A. N.-Vorp. Mt.* 13 (1882) 92-.

### Nobert's Tests.

- Pohl, J. J.* *Wien SB.* 40 (1860) 63-.
- Stodder, C.* [1867] *Am. Nt.* 2 (1869) 93-.
- (*Stodder.*) *Sullivan, W. S.* *Am. J. Sc.* 46 (1868) 347-.
- Woodward, J. J.* *M. Mer. J.* 6 (1871) 26-.
- Webb, W.* *Quek. Mer. Cl. J.* 3 (1873) 155, 198.
- Woodward, J. J.* *Quek. Mer. Cl. J.* 3 (1873) 198-.
- 19th band. *Woodward, J. J.* *QJ. Mer. Sc.* 8 (1868) 225-.
- — —. *Barnard, F. A. P. M. Mer. J.* 6 (1871) 194-.
- — (Barnard). *Woodward, J. J. M. Mer. J.* 7 (1872) 10-.
- — —. *Barnard, F. A. P. M. Mer. J.* 7 (1872) 119-.
- — —, and its observers. *Stodder, C. M. Mer. J.* 5 (1871) 118-; 6 (1871) 201-.
- — —, resolution. *Stodder, C. M. Mer. J.* 3 (1870) 257-.
- — —. *Woodward, J. J. M. Mer. J.* 8 (1872) 227-.
- definition. *Woodward, J. J. M. Mer. J.* 4 (1870) 113-.
- and diatoms in measuring power. *Castracane degli Antelminelli, F.* *Rm. At.* 23 (1869) 111-, 170-.
- — — — —. *Royston-Pigott, G. W. M. Mer. J.* 3 (1870) 305-.

## 3082 Test Objects

## Microscopes 3082

and Möller's diatom type slide and modern microscopes. *Abbott, F.* Tasm. B. S. M. Not. (1869) 85-.

resolution. *Castracane degli Antelminelli, F.* Rm. At. 25 (1872) 268-.

Perfection and testing. *Nobert, F. A.* Pogg. A. 67 (1846) 173-.

## Test Objects.

*Pritchard, A.* Ph. Mg. 2 (1893) 335-.

*Brooke, C.* [1854] R. S. P. 7 (1854-55) 139-.

*Bailey, J. W.* Silliman J. 19 (1855) 28-.

*Woodward, J. J.* Brux. S. Blg. Mcr. Bll. 3 (\*1877) ocoii-.

*Nelson, E. M.* [1868] Mcr. S. J. 4 (\*1884) 139-.

*Amphipleura pellucida.* *Woodward, J. J.* Am. Nt. 6 (1872) 193-.

—, —, *Marpmann, G.* Z. Angew. Mkr. 3 (1898) 175-.

—, —, resolution. *Woodward, J. J.* M. Mcr. J. 6 (1871) 150-; 7 (1872) 165-.

—, —, *Gifford, J. W.* Mcr. S. J. (1892) 173-.

—, —, by central light. *Detmers, H. J.* [1883] Mcr. S. J. 4 (\*1884) 143.

—, —, —, *Moore, A. Y.* [1883] Mcr. S. J. 4 (\*1884) 143.

—, —, —, *Deck, L.* Am. S. Mcr. P. 12 (1890) 170-.

—, —, —, and a violet copper-iodine light filter. *Zettnow, —.* [1893] Quek. Mcr. Cl. J. 5 (1894) 286-.

—, —, and *Surirella gemma.* *Woodward, J. J.* Am. J. Sc. 1 (1871) 345-.

diatoms, resolution of lines. *Nelson, E. M.* Mcr. S. J. 6 (1886) 864-.

—, —, —, *Forgan, W.* [1893] Sc. Mcr. S. P. & T. 1 (1895) 109-.

—, etc., structure. *Wenham, F. H.* M. Mcr. J. 2 (1869) 25-, 158-.

*Navicula Spencerii.* *Bailey, J. W.* Silliman J. 7 (1849) 265-.

— (Bailey). *De La Rue, W.* [1849] Silliman J. 9 (1850) 23-.

— (De la Rue); and 2 new test objects. *Bailey, J. W.* Silliman J. 11 (1851) 82-.

*Pleurosigma angulatum*, dotted appearance. *Dancer, J. B.* Mcr. S. J. 6 (1886) 691-.

— and Lendl's microscope. *Apáthy, S.* Z. Ws. Mkr. 8 (1891) 433-.

—, —, ultimate structure of valve. *Smith, T. F.* [1893] Mcr. S. J. (1894) 141-.

—, —, etc. viewed without central dioptric. *Stephenson, J. W.* Mcr. S. J. 1 (1878) 186-.

— *formosum*, markings. *Nelson, E. M.* Mcr. S. J. (1890) 261.

*Podura* scale, markings. *Royston-Pigott, G. W.* M. Mcr. J. 3 (1870) 13-.

—, —, under ordinary and extraordinary resolving powers. *Royston-Pigott, G. W.* M. Mcr. J. 7 (1872) 170-.

—, —, structure. *Reade, J. B.* M. Mcr. J. 2 (1869) 79-.

—, —, —, *Wenham, F. H.* M. Mcr. J. 6 (1871) 6-.

true form. *Hasert, B.* (vi Adda.) D. Nf. Vsm. B. 34 (1858) 212-.

Test plate, Abbe's. *Zeiss, C.* [1882] Quek. Mcr. Cl. J. 1 (1882-84) 154-.

—, —, Möller's, measurements. *Smith, J. E.* M. Mcr. J. 13 (1875) 240-.

—, —, —, *Morley, E. W.* M. Mcr. J. 15 (1876) 223-.

—, —, plates (Fasoldt's). *Ward, R. H.* Am. S. Mcr. P. (1887) 318-.

—, —, —, *Dudley, R. H.* Mcr. S. J. (1888) 299-.

—, —, (Ward). *Fasoldt, C.* Mcr. S. J. (1888) 817.

—, —, slides. *Heurck, H. van.* Z. Angew. Mkr. 4 (1899) 1-.

Theory. *Abbe, (Dr.) E.* Arch. Mkr. An. 9 (1873) 413-.

—, —, *Strehl, K.* [1898-1900] Z. Instk. 18 (1898) 301-, 356; 19 (1899) 325-; Erlang. Ps. Md. S. Sb. 32 (1901) 1-.

—, —, and practice. *Davis, G. E.* Manch. Mcr. S. Rp. (\*1883-84) 60-.

—, —, —, *Hitchcock, R.* Am. As. P. (1884) 566-.

—, —, —, *Gilly, H.* Ntm. S. Sc. Bll. (1895) xxxii-.

—, —, —, *Marsson, T.* Z. Angew. Mkr. 1 (1896) 33-, 65-.

—, —, progress. *Poli, A.* Rv. Sc.-Ind. 19 (1887) 89-, 109-, 137-.

—, —, simplified. *Pelletan, J. J.* Merg. 10 (1886) 279-.

Tremor, prevention. *Ross, A.* Mcr. J. 1 (1841) 23-.

Tube length, optical. *Crisp, F.* Mcr. S. J. 3 (1883) 816-.

—, —, —, determination. *Ashe, A.* [1892-93] Quek. Mcr. Cl. J. 5 (1894) 152-, 289-.

—, —, —, and resolving power. *Jameson, H. G.* Mcr. S. J. (1892) 272-.

—, —, —, standard. *Gage, S. H., Mercer, A. C., & Barr, C. E.* Am. S. Mcr. P. 12 (1890) 250-.

—, —, —, *Beck, C.* Mcr. S. J. (1893) 814.

Upper work, new. *Berger, M.* Z. Instk. 18 (1898) 129-.

Use. *Audouin, J. V.* A. Sc. Nt. 3 (1824) 354-.

—, —, in agriculture. *Cobb, N. A.* Mcr. S. J. (1897) 433-.

—, —, for drawing. *Alton, E. d'.* D. Nf. B. (1847) 176-.

—, —, of high powers. *Peragallo, H. A.* Merg. 4 (1891-92) 585-.

—, —, in horizontal position. *Slack, H. J.* Mcr. S. J. 4 (1884) 455.

—, —, of low powers, with deep eyepieces. *Slack, H. J.* Intell. Obs. 4 (1863) 169.

—, —, for photography. *Neyreneuf, V. C. R.* 84 (1877) 344-; Caen S. L. Bll. 1 (1877) 131-; J. de Ps. 6 (1877) 124-.

—, —, —, physical and chemical investigations. *Lehmann, O.* Z. Instk. 6 (1886) 325-.

—, —, practical. *Hepworth, J. J.* Mcr. Sc. 4 (1856) 109-; 5 (1857) 1-.

—, —, in workshop. *Rogers, W. A.* Mcr. S. J. 6 (1886) 679-.

## 3084 Eye-pieces

## 3084 Eye-pieces. (See also Astronomy, 2120.)

- achromatic. *Brewster, (Sir) D.* Nicholson J. 14 (1806) 388-.
- , *Ellis, R. L.* Camb. Mth. J. 1 (1839) 269-.
- , 2-lens (of Galileo). *Forti, A.* (vi *Adds.*) Firenze At. Ac. Georg. 1 (1854) 483-.
- , 4-lens. *Sang, E.* Edinb. R. S. P. 14 (1888) 153-.
- , single. *Reade, J. B.* R. S. P. 4 (1840) 195.
- , for telescopes. *Gilbert, L. W.* Gilbert A. 34 (1810) 292-.
- astigmatic. *Gundlach, E.* Mcr. S. J. 6 (1896) 313, 509-.
- , *Stockwell, J. K.* Mcr. S. J. 6 (1886) 313-.
- binocular. *Tolles, R. B.* Am. J. Sc. 39 (1865) 212-.
- , for high powers. *Smith, H. L.* Am. J. Sc. 45 (1868) 42-.
- , stereoscopic, Tolles's. *Smith, H. L. M.* Mcr. J. 6 (1871) 45-.
- cross wires. *Schröder, H.* Cztg. Opt. 18 (1897) 4-, 14-.
- , quartz fibres for. *Bleekrode, L.* Nt. 50 (1894) 174.
- , —, —, *Wadsworth, F. L. O.* [1897] Mcr. S. J. (1898) 232-.
- , in telescope. *Stevens, J. S.* Nt. 59 (1898-99) 255-.
- , —, history. *Hammer, E.* Cztg. Opt. 17 (1896) 221-.
- , —, —, problem. *Littrow, J. J. von.* Oken Isis (1831) 1067-.
- , —, —, *Littrow's.* *Muncke, G. W.* Baumgartner Z. 2 (1833) 53-; 3 (1835) 49-.
- , —, —, self-luminous. *Bohn, K.* (xii) Z. Instk. 2 (1882) 12-.
- diagonal. *Forbes, G. B. A.* Rp. (1878) 449.
- drawing, Leitz's. *Schiemanz, P.* Z. Ws. Mkr. 12 (1895) 289-.
- Ehrlich's.* *Anon.* Mcr. S. J. (1900) 250.
- erecting, new. *Jadanza, N.* Tor. Ac. Sc. At. 22 (1886-87) 447-.
- fluorescent, modified form of Soret's. *Dewar, J., & Liveing, G. D.* Camb. Ph. S. P. 4 (1888) 342-.
- , new. *Martens, F. F.* Z. Instk. 18 (1898) 252-.
- focal length, apparatus to determine. *Brauer, G.* (xii) Rs. C. Ps. S. J. 7 (Ps.) (1875) [Pt. 1] 55-.
- "holoscopic," Watson and Son's. *Anon.* Mcr. S. J. (1899) 651.
- Huygens's.* *Listing, J. B.* Gött. Nr. (1871) 89-.
- , *Hunter, J.* [1896] So. Mcr. S. P. & T. 2 (1900) 61-.
- , achromatism. *Höbgh, E. von.* Cztg. Opt. 7 (1886) 37-, 84.
- , and applications. *Schröder, H.* Cztg. Opt. 19 (1898) 91-, 101-, 113.
- , Ramsden's, achromatism. *Mittenzwey, M.* Cztg. Opt. 7 (1886) 61.
- interchangeable diaphragms. *Malassez, L.* Aroh. An. Mcr. 8 (1900) 436-.
- magnifying power. *Abbe, —.* Mcr. S. J. 4 (1884) 804.
- micrometer-. *Soleil, H.* A. C. 18 (1869) 385-.
- , *Djakonov, D.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 120-; *J. de Ps.* 7 (1888) 220.
- , *Krysiński, S.* Virch. Aroh. 111 (1888) 378-.
- , *Ward, R. H.* J. Mergr. 13 (1889) 209-.
- , *Hartwich, C.* Z. Ws. Mkr. 17 (1900) 156-.
- , compensation-. *Zeiss, —.* Mcr. S. J. (1888) 797-.
- , filar. *Rogers, W. A.* Am. Mor. S. P. 14 (1892) 132.
- , for fixed stages. *Hartwich, C.* Z. Ws. Mkr. 17 (1900) 432-.
- , —, microscopes. *Fischer, A.* Mosc. S. Nt. Bll. 3 (1887) 21-.
- , —, —, *Coulter, —.* Brown-Séguard J. Pl. 2 (1859) 870-.
- , —, —, *Ewell, M. D.* Mcr. S. J. 6 (1886) 316.
- , —, —, *Jones, E. J.* Am. Mcr. J. 11 (1890) 3-.
- , made by photography. *Levison, W. G.* N. Y. Ac. A. 11 (1898) 405-.
- , standard. *Findley, G. M.* Mcr. J. 8 (1872) 264-.
- , *Winkel's.* *Behrens, W.* Z. Ws. Mkr. 2 (1885) 41-.
- , *Zeiss's.* *Anon.* Mcr. S. J. 4 (1884) 118.
- for microphotography. *Neuhauss, R.* Z. Ws. Mkr. 5 (1888) 328-.
- , microscope. *Goodwin, W.* [1889-90] Quek. Mcr. Cl. J. 4 (1892) 71-; Mcr. S. J. (1890) 417.
- , —, —, *Azoulay, —, & Nageotte, —.* Par. S. Bl. Mm. 49 (1897) (C. R.) 641-.
- , with normal reflection. *Cornu, A.* As. Fr. C. R. (1893) (Pt. 1) 205.
- , —, widened field of vision and iris diaphragm. *Czapski, S.* Z. Ws. Mkr. 12 (1895) 437-.
- with moveable indicator, *Kuznitsky's.* *Wildeman, É. de.* Brux. S. Blg. Mcr. Bll. 22 (1897) 12-.
- multiple, *Griffith's.* *Anon.* Mcr. S. J. 4 (1884) 443-.
- nadiral, interference fringes in. *Hurion, A.* J. de Ps. 1 (1892) 414-.
- new. *Krüss, A. H.* A. Ps. C. 153 (1874) 601-.
- , *Nelson, E. M.* [1887] Quek. Mcr. Cl. J. 3 (1889) 173-; Mcr. S. J. (1887) 928.
- , solid. *Reade, J. B.* B. A. Rp. (1850) (pt. 2) 15-.
- nomenclature. *Ward, R. H.* M. Mor. J. 8 (1872) 15-.
- , and sizes. *Ward, R. H., & others.* Am. S. Mor. P. (1884) 228-.
- orthoscopic. *Rabenhorst, L.* Bt. Ztg. 8 (1850) 526-; 9 (1851) 529-.
- polarising. *Cavalleri, G. M.* Mil. At. I. Lomb. 1 (1858) 283-; Mil. I. Lomb. Bd. 6 (1878) 477-.

## Eye-pieces 3084



- polarising, Abbe's. *Anon.* *Mar. S. J.* 4 (1884) 462.
- , Cavalleri's. *Cecchi, (padre) F.* (xii) *Bv. Sc.-Ind.* 5 (1873) 133-.
- , course of light in. *Sang, E.* *Edinb. R. S. P.* 18 (1892) 323-.
- , ————. *Tait, —.* *Edinb. R. S. P.* 18 (1892) 337-.
- , improved, and new projection eye-piece. *Stringer, E. B.* *Mar. S. J.* (1900) 537-.
- with reflecting and polarising attachments. *Fuchs, F.* (xii) *Z. Instk.* 2 (1882) 305-.
- revolving, Leitz's. *Anon.* *Mar. S. J.* (1900) 249-.
- simple lenses as. *Breton [de Champ], Paul.* *C. R.* 50 (1860) 422-.
- starlit transit. *Royston-Pigott, G. W.* *As. S. M. Not.* 36 (1876) 250-.
- stereoscopic. *Abbe, E.* *Carl Rym.* 17 (1881) 197-.
- and substage fittings, standard sizes. *Nelson, E. M.* [1899] *Mar. S. J.* (1900) 141.
- telescopic, measuring the power of. *Adams, D. B.* [1887] *S. Aust. R. S. T.* 11 (1889) 112-.
- , variable magnification. *Goring, C. R.* *Edinb. N. Ph. J.* 25 (1888) 259-.
- terrestrial, formulæ. *Gonnella, T.* *N. Cim.* 18 (1863) 306-.
- theory. *Moutier, J.* *Par. S. Phlm. Bll.* 1 (1877) 172-.
- Concave mirror, use for photography. *Smith, F. J.* [1892] *Nt.* 47 (1892-93) 10.
- Definition, photographic. *Mallock, A.* *Nt.* 44 (1891) 552-.
- Enlargement. *Wallon, É.* *A. Cons. Arts et Mét.* 1 (1899) 422-.
- , apparatus. *Monkhoven, (Dr.) — van.* *Les Mondes* 5 (1864) 125-.
- Exposers, determination of speed. *Pickering, W. H.* *Science* 4 (1884) 454; *Am. Ac. P.* 20 (1885) 478-.
- , principles of construction. *Pickering, W. H.* *Am. Ac. P.* 20 (1885) 483-.
- Focus of chemical, luminous and calorific rays, difference. *Borlinetto, L., & Zantedeschi, —.* *Wien SB.* 21 (1856) 521-.
- equaliser, self-acting. *Claudet, A. F. J.* *B. S. P.* 15 (1867) 456-.
- , photogenic, for daguerreotype. *Cavalleri, G. M.* (vii) *Bb. It.* 13 (1846) 229-.
- Focusing. *Pickering, W. H.* *Science* 1 (\*1883) 160-.
- Image, curvature due to primary and secondary foci of oblique pencils of light. *Bow, R. H.* [1863] (vi *Adds.*) *Pht. S. J.* 8 (1864) 304-, 312-.
- formation by objectives, conditions. *Rohr, M. von.* *Z. Instk.* 17 (1897) 271-; 18 (1898) 4-.
- illumination in landscape photography, method of equalising. *Slight, G. H.* [1867] *Edinb. Sc. S. Arts T.* 7 (1868) 313-.
- Images, form, with large and small lenses. *Brewster, (Sir) D. B. A. Rp.* (1852) (pt. 2) 3-.
- , properties. *Vogel, H.* *A. Ps. C.* 140 (1870) 451-.
- , reflected, in optical combinations. *Dallmeyer, T. R.* *Phot. J.* 14 (1890) 155-.
- Instantaneous perigraph. *Mangin, (col.) A.* *As. Fr. C. R.* (1878) 339-.
- Intensification of photographic pictures, optical device for. *Rayleigh, (Lord).* *Ph. Mg.* 44 (1897) 282-.
- Oblique pencils. *Goddard, J. T.* *Pht. S. J.* 7 (1862) 349-; 8 (1864) 12-, 50-, 209-, 302, 310-, 420-.
- Opera glasses, photographic. *Ferrand, H.* [1897] *Isère S. Bll.* 30 (1899) 129-.
- Optics, photographic. *Brewster, (Sir) D.* [1857] *Pht. S. J.* 4 (1858) 83-.
- , —. *Petzval, J.* *Wien SB.* 24 (1857) 50-, 92-, 129-; 26 (1857) 33-.
- , — (Petzval). *Pretsch, P.* [1857] *Pht. S. J.* 4 (1858) 102-.
- , —. *Symonds, P.* *Pht. Arch.* 1 (1860) 198-, 216-, 238-.
- , —. *Claudet, A. F. J.* *Ph. Mg.* 32 (1866) 212-.
- , —. *Hannot, A.* *Brux. Bll. Pht.* 19 (1880) 46-, 120-, 129-.
- , —. *Caplatzi, A.* *Mar. S. J.* (1891) 818-.
- , —. *Lummer, O.* *Z. Instk.* 17 (1897) 208-, 225-, 264-.
- , —. *Miethe, A. D. Nf. Vh.* (1897) (*Th.* 2, *Hälfte* 1) 132-.
- , —. *Schiffner, F.* *Wien Pht. Cor.* 37 (1900) 550-.
- Perspective photograph, visual point. *Streintz, H.* *Wien Pht. Cor.* 29 (1892) 559-.

### 3085 Photographic Lenses and Systems.

- Camera. *Voigtländer, P. W. F.* [1841] *Dingler* 88 (1842) 187-.
- (Voigtländer's). *Reindl, J.* *Dingler* 86 (1842) 128-.
- , *Pretsch, P.* [1858] *Pht. S. J.* 5 (1859) 39-, 61-.
- , "autograph," Walmsley's. *Fox, C. E.* *Mar. S. J.* (1896) 354.
- , binocular. *Brewster, (Sir) D. B. A. Rp.* (1849) (pt. 2) 5; *Edinb. T. Sc. S. Arts* 3 (1851) 259-.
- , improvements. *Brewster, (Sir) D. B. A. Rp.* (1849) (pt. 2) 5.
- , — suggested by Brewster. *Emerson, E.* *Silliman J.* 32 (1861) 227-.
- lucida applied to photography. *Carlini, F.* *Presse Sc.* 1 (1863) 350-.
- , photoelectric, Jaspar's. *Crahay, J. G.* (vi *Adds.*) *Rm. Cor. Sc.* 3 (1855) 53-.
- , relief of image on ground glass of. *Claudet, A.* *B. S. P.* 8 (1856-57) 569-.
- , solar, for enlarging. *Claudet, A. B. A. Rp.* (1860) (pt. 2) 62-.
- for travelling. *Hannot, A.* *Brux. Bll. Pht.* 20 (1881) 25-.
- , vertical, invention. *Goode, G. B.* *Science* 3 (1884) 672-.
- , —. *Gage, S. H.* *Science* 4 (1884) 5.
- , X-ray photography by. *Nipher, F. E.* *Science* 3 (1896) 783.

Perspective, photographic. *Streints, H.* Wien Pht. Cor. 29 (1892) 477-, 549-.

—, —. *Miethe, A.* Wien Pht. Cor. 31 (1894) 159-.

—, —, apparently incorrect. *Rothwell, J.* [1860] Pht. S. J. 7 (1862) 24-.

Photogrammeter. *Hübl, A. (Frhr.) von.* Wien Pht. Cor. 29 (1892) 269-.

Photogrammetric instruments, new. *Dolezal, E.* Wien Pht. Cor. 37 (1900) 81-.

— methods (with ordinary apparatus). *Schiffner, F.* Wien Pht. Cor. 26 (1889) 262-.

— reconstructions. *Dolezal, E.* Wien Pht. Cor. 35 (1898) 345-, 408-.

— studies. *Schiffner, F.* Wien Pht. Cor. 27 (1890) 814-; 28 (1891) 165-.

Photogrammetry. *Pizzighelli, —.* Wien Pht. Cor. 23 (1886) 119-, 199-, 251-, 404-.

— *Hafferl, F.* [1888] Wien Pht. Cor. 26 (1889) 95-.

— *Harris, C. H.* Aust. As. Rp. (1898) 595-.

—, geometrical theory. *Finsterwalder, S. D.* Mth. Vr. Jbr. 6 (1899) (Heft 2) 1-.

## PHOTOGRAPHIC LENSES.

*Zettnow, E.* Wien Pht. Cor. 27 (1890) 161-.

*Sporžinskij, K. M.* Vars. S. Nt. Tr. (1893-94) (C. R., Ps. C.) Nos. 4 & 5, 10-.

*Miethe, A.* Wien Pht. Cor. 35 (1898) 452-.

achromatic, calculation of numerical elements. *Teynard, F.* C. R. 64 (1867) 1013-.

—, determination. *Forti, A.* N. Cim. 14 (1861) 377-.

anastigmatic. *Goerz, C. P.* Phot. J. 17 (1898) 253-.

—, astigmatism remaining in some. *Hoëgh, E. von.* [1893] Phot. J. 18 (1894) 34-, 92-.

—, Goerz's double, compared with Zeiss's. *Miethe, —, Neuhaus, —, & Stolze, —.* Wien Pht. Cor. 30 (1893) 457-.

—, Voigtländer's triple. *Kaempfer, —.* Wien Pht. Cor. 35 (1898) 173-.

—, —. *Eder, J. M.* Wien Pht. Cor. 35 (1898) 594-.

—, Zeiss's. *Eder, J. M.* Wien Pht. Cor. 28 (1891) 267-.

—, —. *Rudolph, P.* Wien Pht. Cor. 30 (1893) 512-.

antiplanatic, Steinheil's new rapid. *Eder, J. M.* Wien Pht. Cor. 31 (1894) 169-.

aplanatic, with adjustable distance of lenses, Steinheil's. *Eder, J. M.* Wien Pht. Cor. 22 (1885) 277-.

—, baryta-, Waechter's. *Eder, J. M.* Wien Pht. Cor. 29 (1892) 592-.

—, and pantoscope, Hartnaek's new. *Eder, J. M.* Wien Pht. Cor. 27 (1890) 461-.

—, wide-angle, application of prism. *Husenik, J.* Wien Pht. Cor. 17 (1880) 13-.

catadioptric, for celestial photography. *Zenger, C. V.* As. Fr. C. R. (1889) (Pt. 2) 378-; C. R. 109 (1889) 474-.

choroscope, Goerz's. *Eder, J. M.* Wien Pht. Cor. 28 (1891) 223-.

"collinear", Voigtländer's. *Kaempfer, D.* Wien Pht. Cor. 31 (1894) 455-.

"collinear", Voigtländer's. *Eder, J. M.* Wien Pht. Cor. 32 (1895) 6-.

—, —. *Hoëgh, E. von.* Wien Pht. Cor. 32 (1895) 103-.

—, — (Hoëgh). *Kaempfer, D., & Scheffler, H.* Wien Pht. Cor. 32 (1895) 158-.

combination. *Cundell, G. S. (vi Adds.) Ph. Mg. 25 (1844) 173-.*

concentric. *Schröder, —.* Phot. J. 16 (1892) 276-.

conjugate distances, simple method of obtaining. *Lambert, (Rev.) F. C.* Phot. J. 24 (1900) 307-.

construction. *Hunt, R.* [1858] Pht. S. J. 1 (1854) 14-.

— *Aldis, H. L.* Phot. J. 24 (1900) 291-.

—, optical principles. *Grubb, T.* [1857] Pht. S. J. 4 (1853) 106-, 172-.

daguerreotype, chemical and visual foci. *Lerebours, —.* C. R. 23 (1846) 634-.

—, —. *Lerebours, —, & Secretan, —.* C. R. 38 (1854) 789-.

distance beyond which all objects will be in focus with given lens. *Salomons, (Sir) D.* Phot. J. 14 (1890) 47-.

without distortion. *Sutton, T. B. A. Rp.* (1859) (pt. 2) 63-.

double, new. *Listing, J. B.* Gött. Nr. (1865) 348-.

equations, new form. *Jankó, P. von.* Wien Pht. Cor. 32 (1895) 488-.

errors to be corrected. *Nelson, E. M.* Mcr. S. J. (1898) 401-.

euryscopic, perspective in photographs. *Oettingen, A. von.* Dorpat Sb. 8 (1889) 194-.

—, Voigtländer's. *Eder, J. M.* Wien Pht. Cor. 23 (1886) 12-.

—, —. *Angerer, V., et alii.* Wien Pht. Cor. 23 (1886) 359-.

—, —. *Eder, J. M.* Wien Pht. Cor. 26 (1889) 8-; 27 (1890) 553-.

evolution. *Dallmeyer, T. R., & others.* Phot. J. 19 (1895) 221-.

focal length, determination. *Porro, I. C. B.* 33 (1851) 50-.

—, —. *Schmidt, C. von.* Wien Pht. Cor. 25 (1888) 12-.

—, —. *Gerkin, A. L.* Rs. Ps.-C. S. J. 25 (Ps.) (1898) 347; J. de Ps. 3 (1894) 573-.

—, —, — from polar distance. *Müller, O.* Wien Pht. Cor. 29 (1892) 533-.

focometer, use of Dallmeyer's. *Bolas, T.* [1899] Phot. J. 24 (1900) 107-.

—, — Mergier's. *Amet, —.* As. Fr. C. R. (1892) (Pt. 1) 174-.

focometry of positive or negative systems. *Dallmeyer, T. R.* [1896] Phot. J. 23 (1899) 70-.

focus, depth. *Salomons, (Sir) D.* Phot. J. 12 (1888) 160-.

—, —. *Cheyney, W. A.* Franklin I. J. 128 (1889) 356-; 129 (1890) 470-.

—, — and diffusion. *Dallmeyer, T. R.* Phot. J. 12 (1888) 86-.

—, variable, Français's. *Eder, J. M.* Wien Pht. Cor. 27 (1890) 555-.

Fritsch's. *Eder, J. M.* Wien Pht. Cor. 26 (1889) 11-.

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Fritsch's long focus. *Eder, J. M.* Wien Pht. Cor. 30 (1893) 234-.

globe, nature and advantages. *Sellers, C.* Silliman J. 35 (1863) 319-.

—, trial. *Hilgard, J. E.* (vi *Adds.*) U. S. Coast Sv. Rp. (1863) 206-.

Goerz's. *Eder, J. M.* Wien Pht. Cor. 28 (1891) 5-, 72-.

illumination in, de la Crouée's remedy for inequality. *Dallmeyer, T. R.* Phot. J. 19 (1895) 184-.

— focal plane. *Rohr, M. von.* Z. Instk. 18 (1893) 171-, 197-.

microscope objectives. *Nelson, E. M.* Mcr. S. J. (1895) 498.

new form proposed by Steinheil. *Porro, I.* Mil. I. Lomb. Rd. 3 (1866) 99-.

optical centre. *Streintz, H.* Wien Pht. Cor. 29 (1892) 553-.

"orthostigmat." *Anon.* Nt. 62 (1900) 188.

—, Steinheil's. *Eder, J. M.* Wien Pht. Cor. 34 (1897) 400-.

panoramic, theory. *Sutton, T.* Pht. S. J. 6 (1860) 187-.

paraplanatic, Goerz's rapid. *Eder, J. M.* Wien Pht. Cor. 28 (1891) 169-.

for photographic and stereoscopic portraiture. *Brewster, (Sir) D.* Pht. S. J. 7 (1862) 130-.

plano-convex. *Sutton, T.* Pht. S. J. 4 (1858) 252-.

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—, Voigtländer's. *Harting, H.* Wien Pht. Cor. 37 (1900) 279-.

power. *Amann, J.* Laus. S. Vd. Bll. 35 (1899) xix-.

—, graphic method of representing. *Jankó, P. von.* Wien Pht. Cor. 33 (1896) 524-.

for reproduction of maps, etc. *Hannot, A.* Brux. Bll. Pht. 18 (1879) 164-.

simplified type. *Taylor, H. D.* [1894] Phot. J. 19 (1895) 64-.

single, corrected for architecture. *Taylor, J. T.* Phot. J. 12 (1886) 98-.

spectacle lenses as. *Eder, J. M.* Wien Pht. Cor. 30 (1893) 336-.

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— — —. *Grubb, H.* Nt. 37 (1888) 439.

— — —, with reduced secondary spectrum. *Harting, H.* Z. Instk. 19 (1899) 269-.

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—, — astigmatism. *Aldis, H. L.* Phot. J. 20 (1896) 117-.

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—, system of measuring. *Rudolph, P.* [1893] Phot. J. 18 (1894) 79-.

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—, *Longinescu, G. G.* Bucarest S. Sc. Bl. 4 (1895) 116-.

—, *Zschokke, W.* Wien Pht. Cor. 33 (1896) 160-.

—, Dallmeyer's new. *Brown, J.* Glasg. Ph. S. P. 23 (1892) 225-.

—, Fritsch's. *Eder, J. M.* Wien Pht. Cor. 29 (1892) 332-.

—, history and theory. *Jadanza, N.* [1899] Tor. Ac. Sc. Mm. 49 (1900) 153-.

—, Miethe's. *Eder, J. M.* Wien Pht. Cor. 28 (1891) 561-; 29 (1892) 123-.

telescope objectives for astronomical photography. *Zschokke, P.* Wien Pht. Cor. 35 (1898) 585-.

— — —. *Steinheil, R.* Wien Pht. Cor. 36 (1899) 16-.

testing. *Darwin, (Maj.) L.* [1892] R. S. P. 52 (1893) 403-; Phot. J. 17 (1893) 65-.

—, *Miethe, A.* [1893] Phot. J. 18 (1894) 76-.

—, *Zschokke, W.* Wien Pht. Cor. 33 (1896) 477-; 36 (1899) 131-.

— by adjustable lens. *Eder, J. M.* Wien Pht. Cor. 28 (1891) 361.

— and choice. *Steinheil, A.* Carl Rpm. 5 (1869) 193-.

—, Rudolph's method. *Baugh, J. H. A.* Phot. J. 20 (1896) 141-.

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—, compound. *Grubb, T.* [1858] Dubl. R. S. J. 2 (1858-59) 27-.

—, Dallmeyer's new rectilinear. *Eder, J. M.* Wien Pht. Cor. 25 (1888) 189-.

—, single, form and application. *Dallmeyer, T. R.* Phot. J. 13 (1889) 95-.

—, and telescope. *Petzval, J.* Wien SB. 31 (1858) 213-.

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—, Goerz's and Steinheil's. *Eder, J. M.* Wien Pht. Cor. 31 (1894) 114-.

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*Thomson, W. T. C.* B. A. Rp. (1850) (pt. 2) 126-.

*Kingsley, W. T.* [1852-54] (viii) Camb. Ph. S. P. 1 (1866) 117-; (iii) Pht. S. J. 1 (1854) 93-.

*Pohl, J. J., & Weselsky, P.* Wien SB. 23 (1857) 317-.

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*Müller, (Dr.) J.* Freiburg B. 1 (1859) 508-.

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*Moitessier, A.* [1865] Mntp. Mm. Ac. Sect. Sc. 6 (1864-66) (P.V.) 38-  
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*Erkmann, L.* [1871] Fresenius Z. 11 (1872) 37.  
*Sanders, A. M.* Mer. J. 10 (1873) 250-  
*Gayer, E. J. M.* Mer. J. 15 (1876) 258-  
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*Evans, F. H., & Smith, G.* Mer. S. J. 6 (1886) 557-  
*Smith, G.* [1886] Phot. J. 11 (1887) 22-  
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*Marktanner-Turneretscher, G.* Wien Pht. Cor. 24 (1887) 237-  
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*Trambusti, A.* Z. Ws. Mkr. 5 (1888) 335-  
*Sudduth, W. X.* Mer. S. J. (1889) 698-  
*Heurck, H. van.* Mer. S. J. (1890) 104-  
*Piersol, G. A.* Mer. S. J. (1890) 516-  
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*Comber, T.* Mer. S. J. (1891) 407-  
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- Pumphrey, W.* Midl. Ntlist. 8 (1885) 112-  
*Viallanes, H.* Par. S. Bl. Mm. 37 (1885) (C. R.) 404-  
*Tursini, —.* Mer. S. J. 6 (1886) 1060.  
*Anon.* Mer. S. J. (1887) 473-  
*Churchill, (Lord) E.* Mer. S. J. (1888) 1061-  
*Czapki, S.* Z. Instk. 8 (1888) 301-  
*Ragazzoni, A.* Brescia At. Cm. (1889) 16-  
*Muras, T. H.* Mer. S. J. (1892) 426-  
*Lavdowsky, M.* Z. Ws. Mkr. 11 (1894) 313-  
*Czaplewski, E.* Z. Ws. Mkr. 13 (1896) 147-  
*Giles, G. M.* Mer. S. J. (1897) 164-  
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*Bitting, A. W.* [1897] Mer. S. J. (1899) 440-  
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- for astronomical photography. *Mercer, A. C.* Am. Mer. S. T. 18 (1896) 182-  
*Baker's Anon.* Mer. S. J. (1891) 525-  
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 —. *Neyreneuf, V.* Caen S. L. Bl. 1 (1877) 142-  
 —. *Mercer, F. W.* Mer. S. J. 4 (1884) 625-  
 —. *Nelson, E. M.* Mer. S. J. (1887) 1025-  
 —. *Griffith, E. H.* Mer. S. J. (1888) 1031.  
 —. *Kibbler, A.* Mer. S. J. (1889) 127-  
 —. *Walmsley, W. H.* Am. S. Mer. P. 12 (1890) 69-  
 —. *Hardy, J. D.* [1893] Quek. Mer. Cl. J. 5 (1894) 306-  
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 — and condensing system. *Stringer, E. B.* [1897] Mer. S. J. (1898) 174-  
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 — — — —, *Nelson, E. M.* [1897] Mer. S. J. (1898) 140.  
 —, micro-stereoscopic, improved. *Baker, J. G.* Franklin I. J. 148 (1899) 145-  
 —, miniature, *Robinson's Rous, —.* Mer. S. J. 5 (1895) 528-  
 —, *Nachet's Anon.* Mer. S. J. (1893) 98-  
 —, *Nelson's Anon.* Mer. S. J. (1887) 661-  
 —, *Neuhaus's Anon.* Mer. S. J. (1888) 293-  
 — for opaque objects. *Butterworth, J.* Mer. S. J. (1898) 595-, 704.  
 —, *Stegemann's Anon.* Mer. S. J. (1888) 116-  
 —, vertical, *Beck's Anon.* Mer. S. J. (1895) 236-  
 —, — and horizontal combined, *Zeiss's Anon.* Mer. S. J. (1898) 351-  
 —, —, *Pringle's Anon.* Mer. S. J. (1893) 695.  
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 — —, *Wright, J. H.* Bost. S. Md. Sc. J. 3 (1899) 302-  
 complete. *Oppio, L. dall'.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 2) 179-  
 —. *Gaylord, H. R.* Z. Ws. Mkr. 16 (1899) 289-  
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 — —. *Smith, G.* [1887] Mer. S. J. (1888) 119.  
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 —. *Stratton, S. W., & Burrill, T. J.* Am. S. Mer. P. (1885) 103-  
 —. *Deck, L. S.* Am. S. Mer. P. 13 (1891) 49-  
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 — —. *Curties, C. L.* Mer. S. J. (1894) 516-.

- for instantaneous photomicrography. *Scott, A. C.* *Mar. S. J.* (1900) 720-.
- , Nachet's. *Anon.* *Mer. S. J.* 6 (1896) 842-.
- isochromatic plates. *Smith, T. F.* [1892] *Quek. Mor. Cl. J.* 5 (1894) 183-.
- lens, Cooke. *Jourdain, P. E. B.* *Mer. S. J.* (1898) 397-.
- , planar, for low powers. *Jourdain, P. E. B.* *Mer. S. J.* (1898) 399-.
- , Zeiss, for low powers. *Measures, —.* [1897] *Mer. S. J.* (1898) 189.
- lenses and eye-pieces. *Gage, S. H.* *Am. Mor. S. P.* 15 (1893) 25-.
- , suggested improvement in correction. *Piffard, H. G.* *Mer. S. J.* (1893) 786-.
- low power, Reichert's. *Anon.* *Mer. S. J.* (1899) 658-.
- Mawson and Swan's. *Anon.* *Mer. S. J.* (1889) 128.
- and methods. *Capranica, S.* *Z. Ws. Mkr.* 6 (1889) 1-.
- microscope. *Brewster, (Sir) D.* (vi *Adds.*) *Pht. S. J.* 8 (1864) 439-.
- , Bourmans, —. *Les Mondes* 20 (1869) 115-.
- , Curties, C. L. *Mer. S. J.* (1894) 417.
- , Lemardeley, —. *Mer. S. J.* (1894) 518.
- , Measures, —. *Mer. S. J.* (1899) 874.
- , Baker's. *Anon.* *Mer. S. J.* (1894) 517.
- , Nachet's. *Anon.* *Mer. S. J.* 6 (1886) 840-.
- Nachet's. *Anon.* *Mer. S. J.* (1892) 870-.
- , *Anon.* *Mer. S. J.* (1898) 103.
- for photomicrography with strong objectives. *Israel, O.* *Viroh. Arch.* 106 (1886) 502-.
- Pringle's. *Mayall, J. (jun.)* *Mer. S. J.* (1890) 543-.
- small, Reichert's. *Anon.* *Mer. S. J.* (1900) 122-.
- stand, Zeiss's. *Anon.* *Mer. S. J.* (1900) 381.
- for systematic photomicrography. *Shearer, J. B.* *Am. Mor. S. T.* 18 (1896) 117-.
- use at night. *Edmonds, J.* *Midl. Ntlist.* 11 (1888) 23.
- Winkel's. *Gaylord, H. R.* *Z. Ws. Mkr.* 14 (1897) 813-.
- application of acetylene gas. *Walmsley, W. H.* *Am. Mor. S. T.* 18 (1896) 136-.
- artificial illumination. *Shadbolt, G. J.* *Mer. Sc.* 1 (1858) 165-.
- divergent light. *F., S.* *Rv. Trim. Mergr.* 2 (1897) 177-.
- electric arc. *Barnard, J. E.* *Mer. S. J.* (1897) 600.
- , —, —. *Barnard, J. E., & Carver, T. A. B.* [1897] *Mer. S. J.* (1898) 170-.
- light. *Heurck, H. van.* *Brux. S. Blg. Mor. Bl.* 8 (\*1883) lix- or lxii-; 15 (1889) 24-.
- gaslight. *Sternberg, (Maj.) G. M.* *J. H. Un. Cir.* [9 (1889-90)] 72-; *Am. Mor. S. P.* 14 (1892) 85-.
- incandescent lamps. *Stein, T.* *Lum. Élect.* 14 (1884) 127-.
- lime light. *Woodward, J. J.* *Am. J. Sc.* 50 (1870) 386-.
- application of magnesium light. *Roux, E.* *Z. Ws. Mkr.* 5 (1886) 497-.
- , —, —. *Neuhauss, R.* *Z. Ws. Mkr.* 8 (1891) 181-.
- , —, —. *Rohmann, F., & Galewsky, E.* *Z. Ws. Mkr.* 9 (1892) 71.
- , —, —. *Neuhauss, R.* *Z. Ws. Mkr.* 9 (1892) 72-.
- , —, — and electric light. *Woodward, J. J.* *Am. J. Sc.* 49 (1870) 294-.
- , — monochromatic light (yellow). *Smith, T. F.* *Mer. S. J.* (1898) 276-, 285-.
- , —, —. *Pretzl, A. L.* [1897] *Mer. S. J.* (1898) 127-.
- , —, —, influence of absorption pan. *Neuhauss, R.* *Z. Ws. Mkr.* 7 (1890) 20-.
- , — orthochromatism. *Eder, J. M.* *Wien Pht. Cor.* 26 (1889) 7-.
- , —, —. *Monpillard, —.* [1893] *Mer. S. J.* (1894) 113-.
- Siemens's regenerator burner. *Eder, J. M.* *Wien Pht. Cor.* 25 (1888) 488.
- chronophotography. *Weiss, G.* *Par. S. Bl. Mm.* 48 (1896) (C. R.) 645-.
- and coincidence of chemical and visual foci. *Wenham, F. H.* *Mer. S. T.* 3 (1855) 1-.
- of crystals of snow and ice. *Neuhauss, R.* *Z. Ws. Mkr.* 9 (1892) 324-.
- and drawing for scientific purposes. *Maalbe, C. U.* *Z. Ws. Mkr.* 12 (1895) 449-.
- fixation by means of oxyhydrogen microscope. *Gebauer, —.* [1839] *Flora* 23 (1840) 198-, 199-.
- of flagella of bacteria. *Zettnow, E.* *Z. Ws. Mkr.* 9 (1892) 74-.
- focusing. *Ellis, J.* *Mer. S. J.* (1887) 1028.
- , *Lagnier, O.* *Caen S. L. Bl.* 5 (1891) 46-.
- , *Francotte, P.* *Mer. S. J.* (1892) 270.
- high power. *Woodward, J. J.* *Am. J. Sc.* 42 (1866) 189-.
- , —, —. *Barnard, J. E., & Carver, T. A. B.* *Nt.* 57 (1897-98) 448-.
- , —, actinic and visual foci. *Cox, J. D.* *Am. S. Mer. P.* (1885) 29-.
- , —, best technique. *Rafter, G. W.* *Am. S. Mer. P.* 11 (1889) 112-.
- , —, by lamplight. *Cox, J. D.* *Am. S. Mer. P.* (1884) 99-.
- , —, —. *Detmers, H. J.* *Am. S. Mer. P.* 10 (1888) 143-.
- illumination. *Köhler, A.* *Z. Ws. Mkr.* 10 (1893) 433-.
- , *Hunter, J.* *So. Mer. S. P. & T.* 1 (1895) 229-.
- instantaneous. *Holman, D. S.* *Mer. S. J.* 6 (1886) 333.
- , *Stenglein, M.* *Wien Pht. Cor.* 25 (1888) 192-.
- , *Marktanner-Turneretscher, G.* *Mer. S. J.* (1894) 110-.
- , *Stringer, E. B.* *Mer. S. J.* (1898) 282.
- and iso-photography and megaphotography. *Hunt, A. R.* *Nt.* 62 (1900) 79-.
- of large sections. *Nieser, O.* *Z. Ws. Mkr.* 11 (1894) 27.
- , —, —. *Forgan, W.* *So. Mer. S. P. & T.* 1 (1895) 221-.
- metals, Queen's. *Anon.* [1898] *Mer. S. J.* (1901) 207-.

## 3085 Photographic Lenses and Systems

## Camera Lucida 3090

- methods. *Hayes, R. A.* [1888] *Ir. Ac. P.* 4 (\*1884-88) 59-.
- *Moeller, H.* *Z. Ws. Mkr.* 5 (1888) 155-.
- *Neuhaus, R.* *Z. Ws. Mkr.* 5 (1888) 484-.
- *Piffard, —.* *Mer. S. J.* (1892) 868-.
- and microstructure of iron. *Kupelwiesser, F.* *Oestr. Z. Brgw.* 37 (1889) 299-, 309-.
- in natural colours. *Neuhaus, R.* *Z. Ws. Mkr.* 11 (1894) 329-.
- — — *Ives's process.* *Turner, —.* *Mer. S. J.* (1899) 676.
- of opaque objects. *Carlier, E. W., & Mann, G.* [1893] *Sc. Mer. S. P. & T.* 1 (1895) 115-.
- — — *Walmesley, W. H.* *Am. Mer. S. T.* 20 (1899) 189-.
- petroleum, gas and Auer's lamp compared. *Neuhaus, R.* *Z. Ws. Mkr.* 10 (1893) 87-.
- phenomenon interpreted by Abbe diffraction theory. *Nelson, E. M.* [1888] *Quek. Mer. Cl. J.* 3 (1889) 273-.
- photographic printing in. *Landois, H., & Thielen, W.* *Arch. Mkr. An.* 7 (1871) 269-.
- of *Pleurosigma angulatum.* *Hewck, H. van.* *Mer. S. J.* (1890) 261.
- — — *formosum.* *Smith, T. F.* *Mer. S. J.* (1888) 1063-; (1889) 166.
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- — — *Vereker, (Hon.) J. G. P.* [1891] *Mer. S. J.* (1892) 425-.
- — — *Wright, H. G. A.* *Mer. S. J.* (1892) 905-.
- — — *Smith, T. F.* [1892] *Mer. S. J.* (1893) 105-.
- practical, with ordinary objectives. *Bray, T. J.* *Am. Mer. S. T.* 18 (1896) 107-.
- projection of photographs. *Draper, J. C.* *Am. J. Sc.* 15 (1878) 259-.
- reduction of silver salts in photography. *Girard, J. C. R.* 83 (1876) 630-.
- of retinal image in insect eye. *Eder, J. M.* *Z. Ws. Mkr.* 8 (1891) 198-.
- spermatozoa from Triton. *Dowdswell, —.* *Mer. S. J.* (1888) 1065-.
- stereoscopic. *Gebhardt, W.* *Z. Ws. Mkr.* 13 (1896) 419-.
- by sunlight. *Woodward, J. J.* *Am. J. Sc.* 2 (1871) 258-.
- with Tolles's  $\frac{1}{8}$ " objective. *Cutter, E.* *Am. J. Sc.* 18 (1879) 93-.
- use of eye-piece. *Mercer, A. C.* *Am. S. Mer. P.* 12 (1890) 50-.
- — — (Mercer). *Coz, J. D.* *Am. S. Mer. P.* 12 (1890) 54-.
- — — *Mercer, A. C.* *Am. S. Mer. P.* 12 (1890) 247.
- of writing. *Woodward, J. J.* [1873] *Quek. Mer. Cl. J.* 3 (1872-74) 228-.
- with Zeiss apochromatics. *Mayall, J. (jun.)* *Mer. S. J.* (1890) 830-.
- Phototheodolite. *Stolze, —.* *D. Nf. Tbl.* (1886) 187.
- *Pollack, V.* *Wien Pht. Cor.* 29 (1892) 55-.
- *Bridges-Lee.* *Doležal, E.* *Wien Pht. Cor.* 35 (1898) 73-.

- Phototheodolite, Roeha's. *Doležal, E.* *Wien Pht. Cor.* 34 (1897) 178-.
- Physics in photography. *Abney, (Capt.) W. de W.* *Nt.* 18 (1878) 489-, 528-, 543-.
- Pinhole photography. *Eder, J. M.* *Wien Pht. Cor.* 23 (1886) 550-.
- — — *Basilevskij, V. I.* *Ra. Ps.-C. S. J.* 21 (*Ps.*) (1889) 280-; *J. de Ps.* 9 (1890) 539.
- — — *Rayleigh, (Lord).* *B. A. Rp.* (1889) 493-; *Ph. Mg.* 31 (1891) 87-.
- — — *Colson, R. A.* *Cons. Arts et Mét.* 4 (1892) 173-.
- Polarisation of light applied to photography. *Arces, B.* *Phot. J.* 18 (1894) 203-.
- Reflections combined with refractions. *Dallmeyer, T. R.* *Phot. J.* 16 (1892) 103-.
- Ship's movements, photographic registration. *Ach, N.* *Z. Instk.* 19 (1899) 309-.
- Telephotography. *Steinheil, A.* *Wien Pht. Cor.* 29 (1892) 61-.
- *Spitaler, R.* *Wien Pht. Cor.* 29 (1892) 173-.
- *Grüder, —.* *Wien Pht. Cor.* 32 (1895) 189-.
- and photography from balloons. *Meyer-Heine, —.* *A. Cons. Arts et Mét.* 1 (1899) 193-.
- Telescopic photography. *McKay, A.* [1890] *N. Z. I. T.* 23 (1891) 461-.
- Zone plate photography. *Wood, R. W.* *Phot. J.* 24 (1900) 248-.

## 3090 Optical Apparatus not scheduled elsewhere. Stereoscope.

- Anaglyptoscope. *Oppel, J. J.* *Pogg. A.* 99 (1856) 466-.
- Anorthoscope. *Plateau, J. A. F.* *Bruz. Ac. Bll.* 3 (1836) 7-.
- *Carpenter, W. B.* *Stud.* 2 (1869) 110-.
- Anorthoscopic figures. *Zöllner, F.* *Pogg. A.* 117 (1862) 477-.
- — — *Weber, F.* *Z. Mth. Ps.* 12 (1867) 133-.
- Auxanograph. *Hilgendorf, F.* *Berl. Nf. Fr. Sb.* (1887) 39-.

## CAMERA LUCIDA.

- Wollaston, W. H.* *Tilloch Ph. Mg.* 27 (1807) 343-.
- Sheldrake, T.* *Nicholson J.* 23 (1809) 372-.
- Bate, R. B.* *Nicholson J.* 24 (1809) 146-.
- Amici, G. B.* *Bologna Opusc. Sc.* 3 (1819) 25-.
- Vecchi, S.* *N. Cim.* 28 (\*1868) 210-.
- Govi, G.* *Tor. At. Ac. Sc.* 3 (1872-73) 253-.
- Pellerin, —.* *C. R.* 86 (1878) 764-.
- Nachet, — (jun.).* *Par. S. Ps. Sé.* (1882) 101-.
- Govi, G.* *Rm. R. Ac. Linc. Rd.* 5 (1889) (*Sem. 1*) 3-.
- applicable to delineation of flowers. *Robison, (Sir) J.* *Edinb. N. Ph. J.* 30 (1841) 402-.
- versus camera obscura. *Sheldrake, T.* *Nicholson J.* 25 (1810) 173-.

- versus camera obscura. *Pifard, H. G. Mcr. S. J.* (1892) 422-.
- combinations. *Horner, W. G. Thomson A. Ph. 6* (1815) 281-.
- construction. *Minotti, N. G. Majocchi A. Fis. C. 1* (1850) 211-.
- dioptric. *Leysen, E. von. Pogg. A. 56* (1842) 407-.
- Govi's, use in collimation and refractometry. *Lafay, A. C. B.* 130 (1900) 1122-.
- modified. *Lüdicke, M. A. F. Gilbert A. 42* (1812) 338-.
- prism, new property. *Bauernfeind, C. M. Münch. Sb.* (1868) (1) 491-.
- steel. *Chladni, E. F. F. Gilbert A. 61* (1819) 98-.
- use of gilt glass. *Govi, G. C. B.* 79 (1874) 373-.
- silvered glass. *Terquem, A. Ph. Mg. 3* (1877) 541-.
- — — — — *Douglas, J. C. Beng. As. S. P.* (1880) 73-.
- — — — — *Forgan, W.* [1894] *Sc. Mcr. S. P. & T. 1* (1895) 122-.
- Wollaston's, applied to telescope. *Zantedeschi, F. Ven. At.* 15 (1869-70) 1065-.
- Camera obscura, erecting prism for. *Chevalier, C. C. B.* 13 (1841) 233-.
- — and microscope, periscopic. *Wollaston, W. H. Phil. Trans.* (1812) 370-.
- — — — — (Wollaston). *Jones, W. Nicholson J.* 34 (1813) 100-.
- Chromoscope. *Lüdicke, M. A. F. Gilbert A. 36* (1810) 127-.
- , experiments on passage of light through angular openings. *Lüdicke, M. A. F. Gilbert A. 52* (1816) 416-.
- COAST LIGHTING.**
- Loo, D. J. S. van. Batav. Ntk. Ts.* 30 (1868) 149-.
- Apparent lights on pierheads of harbours and rocks. *Stevenson, T. Edinb. T. Sc. S. Arts 4* (1856) 276-.
- Beacons and buoy lamps, means of causing flashes. *Wigham, J. R.* [1899] *Dubl. S. Sc. P. 9* (1899-1902) 76-.
- , illumination by electricity. *Stevenson, T. (C. E.)* [1867] *Edinb. Sc. S. Arts T. 7* (1868) 306-.
- Electric lighting, coast of France. *Boulart, L. Rv. Sc. 1* (1881) 226-.
- — — — — *Guérout, A. Lum. Élect. 5* (\*1881) 25-.
- Illuminating Apparatus for Lighthouses.*  
(See also 6080.)
- Drummond, T. Phil. Trans.* (1830) 383-.
- Barlow, W. H. Phil. Trans.* (1837) 211-.
- Stevenson, T. Edinb. N. Ph. J. 1* (1855) 273-; 13 (1861) 273-.
- Masselin, A. (vi Addis.) ME. I. P.* (1862) 48-.
- Stevenson, T. (C. E.)* [1867] *Edinb. Sc. S. Arts T. 7* (1868) 540-.
- Fraser, A. Medley I. Eng. 5* (1868) 2-.
- Swan, W. Edinb. T. Sc. S. Arts 7* (1868) 473-; 507-.
- Stevenson, T. (C. E.)* [1871-75] *B. A. Rp.* (1871) (Sect.) 37-; *Nt.* 12 (1875) 333-; *Sc. S. Arts T. 9* (1878) 321-.
- Lepaute, H. (fils). As. Fr. C. R.* (1877) 223-.
- Stevenson, T. (C. E.)* [1879] *Nt.* 21 (1880) 156-.
- Harcourt, A. V. Nt.* 35 (1887) 41-, 60-.
- Schöpfleuthner, —. Dingler* 277 (1890) 297-.
- Kenward, J. Science* 21 (1893) 216-.
- Ribière, —. A. Pon. Chaus. 8* (1894) 190-; (1897) (*Trim.* 4) 116-.
- Purves, J. A. Nt.* 61 (1899-1900) 393-.
- annular lenses. *Wigham, J. R. Dubl. S. Sc. P. 6* (1888-90) 525-.
- combination of mirrors used to augment illuminating power, Madras. *Smith, John T. Madras J. 9* (1839) 273.
- — polygonal lenses with plain mirrors. *Brewster, (Sir) D.* [1827] *Edinb. B. S. T. 11* (1831) 33-.
- dioptric. *Fresnel, A. J. Par. S. Phlm. Bll.* (1822) 123-.
- (Fresnel's). *Lovering, J., & Peirce, —. Franklin I. J.* 18 (1849) 249-.
- *Brebner, A. (jun.) I. CE. P. 70* (1889) 386-.
- for catoptric. *Melloni, M. (vi Addis.) Majocchi A. Fis. C. 24* (1846) 321-; 25 (1847) 105-, 214-, 318-; 26 (1847) 101-, 216-, 324-; 27 (1847) 100-.
- and catoptric. *Grunert, J. A. Grunert Arch.* 19 (1852) 241-.
- — and catadioptric. *Hamilton, W. Franklin I. J.* 18 (1849) 67-, 161-, 240-, 335-.
- , for electric light. *Chance, J. T. I. CE. P. 57* (1879) 168-.
- , improvements. *Douglass, W. T., & Purves, J. A. I. CE. P. 137* (1899) 131-.
- , Kirkaldy Harbour. *Sang, E. Edinb. N. Ph. J. 25* (1838) 249-.
- , progress. *Stevenson, C. A. Nt.* 46 (1892) 514-.
- , spherical refractor for. *Stevenson, C. A.* [1888] *Sc. S. Arts T. 12* (1891) 219-.
- for dipping lights. *Brebner, A. I. CE. P. 78* (1884) 361-.
- double holophote. *Brewster, (Sir) D. Edinb. B. S. T. 24* (1867) 635-.
- eclipsing, Belfast Lough. *Bottomley, W. B. A. Rp.* (1874) (Sect.) 220-.
- electric. *Secchi, A. N. Cim.* 3 (1856) 394.
- *Faraday, M.* [1860] *B. I. P. 3* (1858-62) 220-.
- *Reynaud, L. A. Tél.* 6 (1863) 369-.
- *Douglass, (Sir) J. N. I. CE. P. 57* (1879) 77-.
- *Petit, P. L. N. L. Brux. A. Tr. Pbl.* 37 (1880) 261-.
- (for lighthouses and ships). *Common, A. A. Nt.* 31 (1885) 125-.
- *Adams, W. G. Elect.* 16 (1886) 57-, 76-, 97-, 115-, 135-.
- *Hopkinson, J. Elect.* 17 (1886) 518-.
- *Blondel, A. Elect.* 31 (1898) 478-.

3090 *Lighthouses*

- electric, Isle of May. *Stevenson, D. A.* I. ME. P. (1887) 847-.
- , La Hève. *Quinette de Rochemont, —. A.* Pon. Chauss. 19 (1870) 309-.
- , Macquarie and Tino. *Hopkinson, J. I.* CE. P. 87 (1886) 243-.
- , objections. *Allard, E. A.* Pon. Chauss. 3 (1882) 489-.
- , Penmaroh-Eckmuhl. *Du Riche Preller, O.* Sc. Abs. 1 (1898) 678-.
- fixed, new system. *Smith, (Col.) John T.* Madras Eng. Rp. 1 (1839) 41-; R. E. Pp. 5 (1842) 56-.
- and occulting. *Kenward, J.* [1890] Birm. Ph. S. P. 7 (1889-91) 233-.
- gas for. *Wigham, J. R.* [1872] (xi) *Dubl. S. J.* 6 (1875) 192-.
- lamp, double quadriform. *Barrett, W. F.* [1886] *Dubl. S. Sc. P.* 5 (1886-87) 74-.
- lamps, improved forms. *Wigham, J. R.* [1891] *Dubl. S. Sc. P.* 7 (1891-92) 147-.
- holographal system. *Stevenson, T.* *Edinb. T. Sc. S. Arts* 4 (1856) 1-.
- hyper-radial and other lenses. *Kenward, J.* Birm. Ph. S. P. 6 (1887-89) 213-.
- improvements. *Roberts, R.* [1859] *Manch. Ph. S. Mm.* 15 (1860) 166-.
- *Anon.* [1895] *Nt.* 53 (1895-96) 56-.
- Kitson light. *Wigham, J. R.* [1900] *Dubl. S. Sc. P.* 9 (1899-1902) 471-.
- lamps, continuous, method of increasing power. *Wigham, J. R.* [1894] *Dubl. S. Sc. P.* 8 (1893-98) 347-.
- lenses, relative powers. *Brebner, A.* I. CE. P. 111 (1893) 296-; 122 (1895) 300-.
- magneto-electric. *Gladstone, J. H.* *QJ. Sc.* 1 (1864) 70-.
- oil for. *Macadam, S.* [1878] *Sc. S. Arts T.* 10 (1883) 56-.
- refraction protractor, and application to designing of prisms. *Balfour, J. M.* [1867] (vi *Adds.*) *Edinb. T. Sc. S. Arts* 5 (1861) 95-.
- refractors. *Stevenson, C. A.* I. CE. P. 117 (1894) 341-.
- revolving light in harbour of Porto d'Anzio. *Linotte, L. G.* *Arcad.* 23 (1824) 32-.
- lights, masking for any bearing. *Stevenson, T. (C. E.)* *Nt.* 23 (1861) 560-.
- semi-horizon, eclipsing. *Smith, (Col.) John T.* CE. I. T. 2 (1838) 193-; R. E. Pp. 5 (1842) 41-.
- , — and fixed. *Thomson, J. T.* *J. I. Archip.* 6 (1852) 94-.
- semi-revolving. *Thomson, J. T.* *Edinb. T. Sc. S. Arts* 4 (1856) 306-.
- sidereal lamp. *Löwenörn, P. de.* (vi *Adds.*) *Kiöb. Ov.* (1822-23) 2-.
- *Gaudin, A.* *C. R.* 22 (1846) 170-.

*Lighthouses.*

- Arago, D. F. J.* *A. C.* 37 (1828) 392-; *Par. Bur. Long. An.* (1831) 172-.
- Hess, A.* *Crelle J. Bank.* 29 (1850) 70-, 93-, 191-, 349-; 30 (1851) 56-.
- Cowper, —.* [1851] *R. I. P.* 1 (1851-54) 24-.
- Veit-Meyer, —.* [1854] *Berl. Pol. Gs. Vh.* 16 (1855) 18-.

## Optical Apparatus 3090

- Purves, J. A.* [1899] *Glaag. I. Eng. T.* 43 (1900) 19-.
- and beacons and buoys, etc. *Sautter, L.* *Rv. Mar. et Col.* 70 (1881) 299-, 561-; 71 (1881) 502-.
- Bell Rock. *Stevenson, R.* *Edinb. Ph. J.* 12 (1825) 18-.
- deep-sea. *Anderson, C.* [1883] *Eng. S. T.* (1884) 45-.
- Denmark. *Löwenörn, P. de.* *Kiöb. Dn. Vd. Selsk. Skr.* 1 (1800) (*Heft* 2) 179-; 4 (1805-06) (*Heft* 2) 41-, 119-; *Kiöb. Dn. Vd. Selsk. Ath.* 1 (1824) 81-; 2 (1826) 1-.
- and Norway. *Anon.* (vi 1125) *Schröder B. Zeev.* 3 (1823) 54-.
- Eddystone. *Douglass, W. T.* [1883] *I. CE. P.* 75 (\*1884) 20-.
- floating and fixed. *Stevenson, D.* *Franklin I. J.* 31 (1856) 221-.
- , new. *Fryer, A.* [1860] *Manch. Ph. S. Mm.* 1 (1862) 158-.
- , "Wandelaar," and fog signal apparatus. *Boulvin, J.* *Brux. A. Tr. Pbl.* 41 (1884) 415-.
- formulæ and tables for calculating range of light. *Gylden, H.* *Stockh. Öfv.* 29 (*No.* 1) (1872) 71-.
- at high elevations, vertical distribution of light. *Stevenson, T. (C. E.)* [1878] *Nt.* 19 (1879) 19-.
- Horsburgh. *Thomson, J. T.* *J. I. Archip.* 6 (1852) 376-.
- intensity and distance of projection of light. *Allard, E. A.* *Pon. Chauss.* 12 (1876) 5-.
- iron, history and construction. *Merrick, J. V.* *Franklin I. J.* 31 (1856) 145-.
- Italian, ancient and modern. *Cialdi, A.* *Rm. N. Linc. At.* 30 (1877) 308-.
- North British. *Stevenson, R.* *Edinb. N. Ph. J.* 15 (1833) 108-.
- visibility of lights in rapid motion. *Stevenson, A.* *Edinb. N. Ph. J.* 32 (1842) 270-.
- Colorimetric double pipette, Hoppe-Seyler's. *Albrecht, E.* *Z. Instk.* 12 (1892) 417-.
- Colour, form and motion, reproduction. *Cros, C. C. R.* 82 (1876) 1515; 83 (1876) 291-.
- Concentrator, pyramidal, for solar rays. *De-laurier, É.* [1882] *Les Mondes* 4 (1883) 253-.
- Cyclostat for observation of rapidly rotating bodies. *Thury, —.* *Arch. Sc. Ps. Nt.* 15 (1886) 141-.
- Diacatoptron. *Gibbes, G. S.* *Tilloch Ph. Mg.* 39 (1812) 127-.
- Dicatopter, von Hagenow's patent. *Emsmann, H.* *Pogg. A.* 88 (1853) 242-.
- Dipleidoscope and passage-prisms. *Kühn, O.* *Cztg. Opt.* 7 (1888) 169-.
- , theory. *Grunert, J. A.* *Grunert Arch.* 5 (1844) 343-.
- Displacements, small, experimental arrangement for measuring. *Righi, A.* *Bologna Rd.* 1 (1897) 185-.
- Drawing objects natural size, apparatus for. *Bausch, H.* *Mcr. S. J.* (1900) 734-.
- Elementary optics, apparatus for demonstration of laws. *Gariel, C. M.* *As. Fr. C. R.* 8 (1874) 244-; 8 (1879) 423-.



## 3090 Optical Apparatus

- Firing arrangement, optical, for covered batteries. *Frayssix, B. de.* C. R. 90 (1880) 1850-.
- Flexure, new optical apparatus for studying. *Lawry, M., & Tresca, H. É.* C. R. 95 (1882) 1114-.
- Foometer. *Snellen, H.* Donders Ndl. Gast. Oogl. Vs. 17 (1876) 204-.
- , Abbe's. *Czapski, S.* Z. Instk. 12 (1892) 185-.
- , new. *Mergier, G. É.* As. Fr. C. R. (1886) (Pt. 1) 100; Par. S. Ps. Sé. (1887) 193-.
- , —. *Everett, J. D.* L. Ps. S. P. 12 (1894) 180-; Ph. Mg. 35 (1893) 833-.
- , —. *Guilloz, T.* As. Fr. C. R. (1895) (Pt. 2) 410-.
- , universal. *Weiss, G.* Par. S. Ps. Sé. (1895) 35-.
- Fountain, luminous. *Trouvé, G.* C. R. 113 (1891) 596-; 115 (1892) 424-.
- Gauss plate, most favourable position. *Walter, B. A.* Ps. C. 52 (1894) 762-.
- Glass cell with parallel sides. *Clowes, F.* Ph. Mg. 48 (1874) 61-.
- , varnish to facilitate writing on. *Terquem, A.* Par. S. Ps. Sé. (1876) 114-.
- Heliastron or solar-compass. *Watt, M.* Edinb. N. Ph. J. 4 (1828) 16-.
- Iconographic apparatus. *Vanghetti, G. Z.* Ws. Mkr. 10 (1893) 457.
- Image-finder, automatic. *Bodkin, (Rev.) R. C.* [1894] Dubl. S. Sc. P. 8 (1893-98) 281-.
- Internal reflection in glass rod used for illumination of cavities. *Robison, (Sir) J. B. A.* Rp. (1842) (pt. 2) 27.
- Kaleidopolariscope. *Petrina, F. A.* Pogg. A. 49 (1840) 236-.
- Kaleidoscope. *Bradley, R.* Tilloch Ph. Mg. 51 (1818) 376-.
- , *Brewster, (Sir) D.* Bb. Un. 8 (1818) 155-.
- , *Gilbert, L. W.* Gilbert A. 59 (1818) 341-.
- , *Playfair, J.* QJ. Sc. 5 (1818) 324-.
- , *Roget, P. M.* Thomson A. Ph. 11 (1818) 375-.
- , *Vallot, J. N.* Dijon Sé. Ac. (1818) 106-.
- , *Wurzer, F.* Gilbert A. 59 (1818) 368-.
- , *Mack, K.* Exner Rpm. 21 (1885) 567-.
- and its application to the arts. *Luca, P. A. de.* Il Progresso 14 (1836) 82-; Nap. Rd. 1 (1842) 66 (166)-.
- , problem. *Weiss, A.* Pogg. A. 84 (1851) 145-.
- Kaloscope. *Heys, W. H.* [1861] Manch. Ph. S. Mm. 1 (1862) 234-.
- Kinematograph, electric. *Nicholl, W.* Belfast NH. S. Rp. & P. (1896-97) 62-.
- Kinematography, Marey's apparatus. *Hermann, —.* Königsb. Schr. 36 (1895) [15].
- Lactoscope. *Séguier, A.* C. R. 17 (1843) 585-.
- Laryngoscope, history. *Blumgrund, E.* Cztg. Opt. 20 (1899) 32-.
- Magnification of dioptric apparatus, instrument for experimental demonstration of theory. *Mergier, É.* Par. S. Ps. Sé. (1886) 60-.
- — optical instruments, apparatus for measuring. *Govi, G.* [1863] (vii) Tor. Mm. Ac. 23 (1866) 455-.
- — — — —. *Oberbeck, A.* N.-Vorp. Mt. 19 (1888) 71-.
- Magnifying apparatus. *Schilberszky, K. (jun.)* Term. Közl. 22 (1890) (Suppl.) 47-.

## Optical Telegraphy 3090

- Measuring instruments with movable mirror showing image of fixed scale in telescope, determination of angle of rotation. *Stegmann, F.* Grunert Arch. 25 (1855) 376-.
- Micrometers, methods of cutting rock-crystal for. *Wollaston, W. H.* Phil. Trans. (1820) 126-.
- , prismatic. *Amici, G. B.* Zach Cor. 8 (1823) 67-.
- Micrometric measurement by optical images. *Abbe, E.* [1878] Jena. Sb. (1879) xi-.
- Mirror method, modification of Poggendorff's. *Du Bois, H. E. J. G.* A. Ps. C. 38 (1889) 494-.
- reading, apparatus for illuminating scales. *Kamerlingh Onnes, —.* Amst. Ak. Vs. 4 (1896) 311-; Arch. Néerl. 1 (1898) 405-.
- Mirror-lineal. *Reusch, F. E. von.* Carl Rpm. 16 (1880) 255-.
- Momentary attitudes, rapid view instrument for. *Galton, F.* Nt. 26 (1882) 249-.
- Monochromatroscope. *Thierry, M. de.* C. B. 118 (1894) 636-.
- Monostereoscope. *Boblin, A.* Brux. Ac. Bll. 5 (1858) 304-.
- , Boblin's. *Scarpellini, C.* Rm. Cor. Sc. 5 (1859) 137.
- Multireflector for use with galvanometers, etc. *Ayrton, W. E., & Perry, J.* Lum. Élect. 5 (\*1881) 38-.
- Optical experiment (wheels rotating in opposite directions). *Arago, F.* Rv. Mar. et Col. 46 (1875) 444-.
- instrument, new (combining compound microscope, camera lucida, etc.). *Waddell, A.* Edinb. Ph. J. 5 (1821) 143-.
- model illustrating character of vibrations in crystal cut parallel to axis, when plane-polarised light is incident upon it. *Rücker, A. W.* L. Ps. S. P. 10 (1890) 11-.
- surfaces, working. *Gautier, P. J. de.* Ps. 8 (1899) 477-.

## OPTICAL TELEGRAPHY.

- Anon.* [1788] (vi 11) Am. Ph. S. T. 4 (1799) 162-.
- Cooke, J.* [1794] Ir. Ac. T. 6 (1797) 77-.
- Edgeworth, R. L.* [1795-96] Ir. Ac. T. 6 (1797) 95-, 313-.
- (Bréguet and Bétancourt.) [*Lagrange, J. L., et alii non*] *Lagrange, J. L., & Legendre, —.* Par. Mm. de l'I. 3 (1800-01) 22-.
- Carney, J. A.* Mntp. Rec. Bll. 2 (1805) 289-.
- Lamanon, P.* J. de Ps. 65 (1807) 5-.
- Pasley, (Sir) C. W.* Tilloch Ph. Mg. 29 (1807) 205-, 292-.
- Le Hardy, C.* Tilloch Ph. Mg. 33 (1809) 343-.
- Edgeworth, R. L.* Nicholson J. 26 (1810) 181-.
- Parrot, G. F.* [1834] St Pét. Ac. Sc. Mm. 3 (1838) 239-.
- Laussedat, A.* As. Fr. C. R. (1874) 1267-.
- Léard, A. A.* Tél. 2 (1875) 379-.
- Mercadier, E.* Lum. Élect. 2 (\*1880) 146-, 502-; A. Tél. 7 (1880) 5-, 118-, 544-; 8 (1881) 44-, 167-.
- Nansouty, M. de.* Gén. Civ. 7 (1885) 116-, 133-, 150-.

## 3090 Optical Apparatus

- Boucharé, E. A. Tél. 14* (1887) 342-.
- Dieudonné, E. Lum. Élect. 26* (1887) 423-.
- automatic receiver. *Ducretet, E. C. R. 105* (1887) 664-.
- transmission and reception of messages by. *Martin de Brettes, J. B. C. R. 95* (1882) 25-.
- best source of light. *Ellie, R. Bordeaux S. Sc. PV. (1894-95)* 75-.
- in France (semaphores and lamps). *Lambel, — (comtede). Par. Bil. S. Encour. 44* (1845) 228-.
- heliograph. *Anderson, T. B. A. Rp. (1880)* 461-.
- *Blakesley, T. H. [1887] Un. Serv. I. J. 31* (1887-88) 593-.
- for U.S. military service. *Grugan, F. C. [U.S.] Chief Sig. Off. A. Rp. (1882) (Pt. 1)* 95-.
- heliographic. *Lescurre, J. A. Tél. 1* (1856) 113-, 137-.
- heliostat, hand-. *Galton, F. [1858]. Gg. S. P. 4* (1860) 14-.
- in Holland. *Staring, W. C. A. 's Gravenh. I. Ing. Ts. (1890-91) (Vh.)* 279-.
- intermittent signals, method of producing. *Crova, A. C. R. 91* (1880) 1061-.
- , methods of producing. *Mercadier, E. C. R. 91* (1880) 982-; 92 (1881) 131-.
- between London and Dublin. *Hall, (Sir) J. Tilloch Ph. Mg. 84* (1809) 124-.
- magnesium flash signals. *Regnard, P. Par. S. Bl. Mm. 41* (1889) (C. R.) 297-.
- between Mauritius and Réunion. *Adam, L. P. C. R. 95* (1882) 585-.
- (Adam's system). *Faye, H. A. É. C. R. 96* (1883) 1763-.
- *Bridet, —. C. R. 99* (1884) 425-.
- nocturnal, French marine. *Méritens, A. de. A. Tél. 12* (1885) 152-.
- telegoue. *Gaumes, F. Par. S. Gg. C. R. (\*1882)* 132-.
- Optigraph. *Jones, T. Tilloch Ph. Mg. 28* (1807) 66-.
- Pantoscope. *Johnson, J. R. Manch. Lt. Ph. S. P. 5* (1866) 135-.
- , Morochov's. *Timiriachev, K. [1892] Mosc. S. Sc. Bil. 78* (No. 2) (1893) 4-.
- Perspective drawing, apparatus. *Hansen, W. Dingler 130* (1853) 1-.
- Phakinescope for producing moving pictures. *Abadie-Dutemps, E. Toul. Ac. Sc. Mm. 8* (1896) 555-.
- Phakometer, oscillatory. *Dévé, C. C. R. 128* (1899) 1561-.
- Phantasmagoria, improvement. *Ritchie, W. Edinb. J. Sc. 4* (1826) 37.
- Phantasmascopie. *Walker, Ez. Tilloch Ph. Mg. 27* (1807) 97-.
- Phenakistoscope. *Plateau, J. A. F. A. C. 58* (1833) 304-.
- *Holten, C. Sk. Nf. F. 8* (1860) 565-.
- Photochromoscope (heliocromoscope). *Ives, F. E. [1892] Franklin I. J. 135* (1893) 35-.
- (Ives's). *Eder, J. M. Wien Pht. Cor. 30* (1893) 572-.
- *Ives, F. E. [1896] Sc. S. Arts T. 14* (1898) 186-.
- (Ives's). *Heinemann, G. D. Nf. Vh. (1898) (Th. 2, Hälfte 1)* 173-.

## Projection Apparatus 3090

- Photochromoscope (Ives's). *Hagenbach, A. Bonn Niedr. Gs. Sb. (1899)* 14-.
- (—). *Petruschky, —. [1899] Danzig Sohr. 10* (1899-1902) (Hefte 2 & 3) xx-.
- (—). *Lakowitz, C. [1899] Danzig Sohr. 10* (1899-1902) (Hefte 2 & 3) xxviii.
- Photoelectric apparatus maintaining light at same point. *Jaspar, J. Brux. Ac. Bil. 20* (1853) 478-.
- Plane, parallel, perpendicular and oblique surfaces, optical apparatus to control. *Laurent, L. C. R. 96* (1883) 1035-.
- plates, manufacture. *Pistor, C. H. Gilbert A. 49* (1815) 161-.
- —, testing. *Kundt, A. Pogg. A. 120* (1863) 46-.
- —, — apparatus. *Oertling, A. Pogg. A. 59* (1843) 284-.
- —, —. *Halle, G. D. Nf. Vh. (1897) (Th. 2, Hälfte 1)* 127-.
- Prism adjustment, Wollaston's method. *Pulfrich, C. A. Ps. C. 31* (1887) 734-.
- (Pulfrich). *Hecht, E. A. Ps. C. 32* (1887) 275-.
- , reversion-, as terrestrial ocular and for measuring angles. *Dove, H. W. Pogg. A. 83* (1851) 189-.
- , —, theory. *Wanach, B. Z. Instk. 19* (1899) 161-, 224.
- Prisms, applications. *Hodgson, W. Edinb. N. Ph. J. 52* (1852) 137-.
- , —. *Bohn, C. Z. Instk. 8* (1888) 359-.
- , crossed. *Bohn, C. Z. Instk. 9* (1889) 62-.
- , —, of Starke and Kammerer. *Lorber, F. Z. Instk. 8* (1888) 283-.
- , Luxfer. *Anon. Rv. Sc.-Ind. 32* (1900) 150-.
- , —. *Anon. Rv. Sc.-Ind. 32* (1900) 195-.
- , —, illuminative power. *Anon. Rv. Sc.-Ind. 32* (1900) 257-.
- , right-angled, precision apparatus for measuring. *Halle, G. D. Nf. Vh. (1897) (Th. 2, Hälfte 1)* 125-.
- PROJECTION APPARATUS.
- Uchatius, F. Wien SB. (1853)* 482-.
- Mach, E. Carl Rpm. 7* (1871) 261-.
- Vogel, H. D. C. Gs. B. 6* (1873) 1845-.
- Laurent, L. Par. S. Ps. Sé. (1877)* 80-.
- Arsenal, A. d'. Par. S. Bl. Mm. 37* (1885) (C.R.) 212.
- Salomons, (Sir) D. [1892] R. I. P. 13* (1893) 534-.
- Mühlenbruck, H. Laus. S. Vd. Bil. 83* (1897) xxiv-.
- Behrens, W. Z. Ws. Mkr. 15* (1898) 7-.
- Measures, J. W. Mcr. S. J. (1900)* 287-.
- Uhthoff, —. Breal. Schl. Gs. Jbr. (1900) (Ab. 1a)* 118-.
- absorption of heat. *Zoth, O. Z. Ws. Mkr. 10* (1893) 152-.
- acetylene lamp, Gossart's. *Rocourt, — de. Toul. S. H. Nt. Bil. (1897)* 244-.
- , portable. *Jehl, V. Toul. S. H. Nt. Bil. (1897)* 243-.
- arc lamp. *Rühlmann, R. Elekttech. Z. 6* (1885) 300-.
- — suitable for Duboscq lantern. *Thompson, S. P. L. Pa. S. P. 8* (1887) 184-; *Ph. Mg. 23* (1887) 333-.

### 3090 Projection Apparatus

arc light, adaptation to projection. *Laudy, L.* H. N. Y. Ac. T. 10 (1890-91) 108-.

—, reflecting and direct acting polariscope for. *Knipe, O.* Science 22 (1893) 272.

combination. *Hughes, W. C.* Mcr. S. J. (1889) 117-.

condensers. *Henry, L. d'.* (xii) Lille S. Mm. 5 (1868) 5-.

construction and uses. *Anon.* Elect. 30 (1893) 718-, 739-.

diorama, portable. *Tait, G.* Edinb. N. Ph. J. 32 (1842) 142-.

electric couple for. *Cole, A. D.* Denison Un. Sc. Lb. Bll. 5 (1890) 20-.

ether-oxygen. *Pellin, P.* Par. S. Ps. Sé. (1891) 171.

—, new form. *Prowse, G. R.* [1891] Cn. R. S. P. & T. 9 (1892) (Sect. 3) 55-.

explosion of Bourdon manometer. *Lacaze-Duthiers, —.* C. R. 125 (1897) 12-.

for horizontally placed bodies. *Duboscq, J.* Par. S. Ps. Sé. (1876) 6-.

incandescent light (Welsbach) with oxygen supply attachment. *Penman, W.* [1895] Sc. S. Arts T. 14 (1898) 43-.

— lighting by primary batteries. *Dresser, A. R.* Phot. J. 10 (1866) 91-.

megascopes, Charles's. *Hombres-Firnas, L. A. d'.* Gard Not. Tr. Ac. (1807) 143-.

—, new form. *Knight, J. B.* Franklin I. J. 73 (1877) 335-.

for monochromatic and mixed light. *Abney, (Capt.) W. de W.* L. Ps. S. P. 7 (1886) 181-; Ph. Mg. 20 (1885) 172-.

Newtonian. *Anon.* Mcr. S. J. (1898) 678-.

photometric properties of lenses. *Blondel, A.* As. Fr. C. R. (1899) (Pt. 2) 316-.

with polarised light. *Laurent, L. C. R.* 85 (1877) 1162-.

polarising, modification of Soleil's. *Lovering, J.* Am. As. P. (1853) 24-.

for projecting spectra. *Pellin, —.* Par. S. Ps. Sé. (1888) 305.

rectifying apparatus, Duboscq's. *Bertin, A.* Par. S. Ps. Sé. (1879) 73-.

slides, coloured projections of uncoloured. *Vidal, L.* Par. S. Ps. Sé. (1892) 214-.

—, colouring. *Scott, J. A.* [1894] Dubl. S. Sc. P. 8 (1893-98) 263-.

—, preparation (Woodbury process). *Smith, G.* [1886] Phot. J. 11 (1887) 22-.

—, —. *Stanley, W.* Manch. Mcr. S. T. (1886) 67-.

stereoscopic. *Moëssard, —.* C. R. 120 (1895) 1108-.

—, *Bryan, G. H.* Nt. 57 (1897-98) 511.

—, d'Almeida's. *Morauf, E.* Wien Pht. Cor. 28 (1891) 163-.

turntable. *Müller, F. Z. Ws. Mkr.* 17 (1900) 162-.

with variable magnification. *Crova, A. J. de* Ps. 10 (1881) 158-.

Projection of images formed between 2 plane mirrors. *Bibart, É. J. de Ps.* 9 (1880) 11-.

— and increase of light. *Lester, —.* Tilloch Ph. Mg. 52 (1818) 68-.

### Optical Apparatus 3090

Pseudoscope, new form. *Wood, R. W.* Science 10 (1899) 648-.

—, single picture. *Salomons, (Sir) D.* Nt. 57 (1897-98) 317-.

Railway signals. *Stevenson, A.* Edinb. N. Ph. J. 30 (1841) 347-.

—, —. *Treutler, G. A.* Dingler 99 (1846) 84-.

Reflecting instruments. *Dantas Pereira, J. M.* Lisb. Mm. Ac. Sc. 2 (1799) 159-.

—, —, apparent motion of image when turned round optic axis. *Dubois, E.* Les Mondes 10 (\*1866) 306-.

—, —, correction of errors of eccentricity. *Hülleret, G.* Rv. Mar. et Col. 87 (1885) 237-, 482-.

—, — for measuring small angles, magnification. *Lermantov, V. V.* Ra. Ps.-C. S. J. 22 (Ps.) (1890) 261-; Fschr. Ps. (1890) (Ab. 2) 206.

—, —, theory. *Čubr [Czuber], E.* Časopis 2 (\*1873) 233-; Bll. Sc. Mth. As. 8 (1875) 124-.

Refractoscope, crystal. *Pulfrich, C. A.* Ps. C. 30 (1887) 317-.

Rotary motion, optical method of investigating. *Clarke, (Lt.) G. S.* [1877] Camb. Ph. S. P. 3 (1880) 90-.

Search lights with parabolic glass-mirrors. *Anon.* Elekttech. Z. 11 (1890) 371-.

Sextant. *Hermans, H.* Brux. A. Tr. Pbl. 1 (1896) 41-.

— for accurate observations. *Schwerer, (Lt.) A.* Rv. Mar. et Col. 105 (1890) 80-.

—, adjustment of mirror. *Braun, C.* Z. Instk. 8 (1888) 238-.

—, errors when mirrors are not perpendicular to graduated arc. *Lemoch, I.* Grunert Arch. 25 (1855) 167-.

—, — and use. *Kayser, E.* [1892] Danzig Schr. 8 (1892-94) (Heft 1) 155-.

—, lighting arrangement for vernier, for night observations. *Besson, —.* Rv. Mar. et Col. 87 (1885) 602-.

— for night observations, binocular. *Cuerville, C. de.* Rv. Mar. et Col. 83 (1884) 171-.

—, —, —, modification. *Blanchin, —.* Rv. Mar. et Col. 80 (1884) 731.

"Simmetrizzatore" as universal kaleidoscope and as educational instrument. *Luca, P. A. de.* Nap. Rd. 3 (1844) 161-.

Spherometers, prismatic. *Meyerstein, M. A.* Ps. C. 126 (1865) 589-; D. Nt. B. 40 (1865) 104.

Stepped lens, theory. *Matthiessen, L.* Cztg. Opt. 7 (1886) 109-.

Stereometer. *Marie, T., & Ribaut, H.* C. R. 128 (1899) 1008-.

Stereomonoscope, by which single picture produces stereoscopic effect. *Claudet, A.* [1858] R. S. P. 9 (1857-59) 194-.

#### STEREOSCOPE.

(See also 4440.)

*Faye, H. A. É.* C. R. 43 (1856) 673-.

*Almeida, J. C. d'.* C. R. 47 (1858) 61-.

*Pick, H.* Wien Schr. Vr. Nw. Kennt. 2 (1861-62) 297-.

## 3090 Stereoscope

- Stroh*, A. R. S. P. 40 (1886) 317-; 41 (1887) 274.
- Righi*, A. Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 862-.
- and its applications. *Himes*, C. F. Franklin I. J. 123 (1887) 898-, 425-.
- binocular vision. *Wheatstone*, (Sir) C. B. A. Rp. (1838) (pt. 2) 16-.
- — — *Tyndall*, J. [1856] Ph. S. J. 3 (1857) 96-, 116-, 167-.
- — — *Newton*, J. Lanc. T. Hist. S. 9 (1857) 272-.
- — — *Claparède*, E. Bb. Un. Arch. 3 (1858) 138-.
- — — *Donkin*, W. F. Phot. J. 12 (1888) 45-.
- — — *Blath*, L. Magdeb. Nt. Vr. Jbr. u. Ab. (1894-96) 69-.
- diaphragmatic. *Volpicelli*, P. Rm. At. 7 (1853-54) 219-, 275-; N. Cim. 12 (1860) 181-.
- improvements. *Grubb*, (Sir) H. [1879] Dubl. S. Sc. P. 2 (1880) 179-.
- for large pictures, 2 new forms. *Elliot*, J. (vi Adds.) Ph. Mg. 13 (1857) 104-.
- lenses and spectacles. *Berger*, E. D. Ps. Gs. Vh. (1900) 160-.
- lenticular, improvement. *Emerson*, E. Silliman J. 32 (1861) 403-.
- mathematics. *Steinhauser*, A. Carl Rpm. 13 (1877) 483-.
- modification. *Oppel*, J. J. (vi Adds.) Frkf. Jbr. Ps. Vr. (1855-56) 37-; (iv) (1858-59) 22-.
- with movable pictures. *Halske*, G. G. Pogg. A. 100 (1857) 657-.
- photographs giving exact perspective. *Cases*, —. Par. S. Ps. Sé. (1885) 115-.
- of moving point. *Marcy*, —. Par. S. Ps. Sé. (1885) 67-.
- pictures with one camera. *Dickson*, R. [1855] Ph. S. J. 2 (1856) 170-.
- , Chimenti. *Reade*, J. B. [1862] Ph. S. J. 8 (1864) 29-.
- as platoscope. *Oppel*, J. J. Frkf. Jbr. Ps. Vr. (1858-59) 64-.
- prismatic and reflecting. *Dove*, H. W. Pogg. A. 83 (1851) 183-.
- reversible. *Stevens*, W. Le C. N. Y. Ac. T. 1 (1881-82) 118-; Am. J. Sc. 23 (1882) 226-.
- and adjustable. *Stevens*, W. Le C. Ph. Mg. 13 (1882) 322-.
- with rotating prisms. *Schweder*, G. Riga Cor.-Bl. 40 (1898) 95-, 97-.
- theory. *Stevens*, W. Le C. Franklin I. J. 84 (1882) 279-.
- *Righi*, A. Bologna Ac. Sc. Mm. 2 (1891) 251-.
- *Marie*, T., & *Ribaut*, H. C. R. 127 (1898) 321-.
- use of camera lucida as. *Wilde*, E. Pogg. A. 85 (1852) 63-.
- Wheatstone's catoptric and Brewster's dioptric. *Massimo*, M. (viii) Rm. At. 4 (1850-51) 140-.

## Telemeters 3090

- Stroboscopic discs, phenakistoscope, phantascopes. *Poggendorff*, J. C. Pogg. A. 32 (1834) 636-.
- phenomena. *Fischer*, O. Ph. Stud. 8 (1886) 128-.
- — — *Marbe*, K. Ph. Stud. 14 (1898) 376-.
- — — *Dürr*, E. Ph. Stud. 15 (1900) 501-.
- Telescope for altering lineal proportions of objects. *Brewster*, (Sir) D. Edinb. Ph. J. 6 (1822) 334-.

## TELEMETERS.

(See also Geography 87.)

- Fallon*, L. A. von. Zach M. Cor. 6 (1802) 246-.
- Doppler*, C. Böhm. Gs. Ab. 3 (1843-44) 769-.
- Laurent*, P. Nancy Mm. S. Sc. (1845) 58-.
- Liagre*, J. Brux. Ac. Bll. 20 (1853) 324-; 21 (1854) (pte. 2) 162-.
- Rottermund*, —. Par. S. Gl. Bll. 11 (1858-54) 230-.
- Albertotti*, G. Tor. Ac. Sc. At. 17 (1881) 749-.
- Audouard*, —. Brest S. Ac. Bll. 13 (1888) 173-.
- Barr*, A., & *Stroud*, W. B. A. Rp. (1890) 499-.
- Drude*, P. Z. Instk. 10 (1890) 323-.
- Barr*, A., & *Stroud*, W. I. ME. P. (1896) 33-.
- Hensoldt*, M. Cz. Opt. 20 (1899) 191-; 21 (1900) 21-, 91.
- Sprenger*, E. Cz. Opt. 20 (1899) 231-; 21 (1900) 41, 112.
- Adie's*. *Adie*, P. [1880] Un. Serv. I. J. 24 (1881) 230-.
- Cerebotani's*. *Börsch*, A. Z. Instk. 6 (1886) 77-, 125-.
- depression-. *Audouard*, P. Rv. Mar. et Col. 100 (1889) 5-; Brest S. Ac. Bll. 16 (1891) 159-; 17 (1892) 419-.
- *Bourgeois*, A. [1891] Brest S. Ac. Bll. 19 (1894) 237-.
- history. *Hammer*, E. Z. Instk. 12 (1892) 155-; 17 (1897) 278-.
- Jaeger's*. *Schneider*, E. Carl Rpm. 14 (1878) 487-.
- for measuring distance and altitudes. *Kérislis*, — de. Rv. Mar. et Col. 129 (1896) 216-.
- — variation of distance between 2 ships. *Jones*, T. Tilloch Ph. Mg. 22 (1805) 319-.
- method of utilising indications. *Audouard*, P. Rv. Mar. et Col. 118 (1893) 311-.
- Porro's*. *Hensoldt*, M. Z. Instk. 5 (1885) 413-.
- reflecting, with constant parallax. *Breton*, H. [1873] (xii) Isère S. Bll. 5 (1876) 266-.
- Romershausen's*. *Wiegand*, A. Grunert Arch. 13 (1849) 162-.
- stereocollimator. *Place*, — de. C. R. 116 (1893) 373.
- (de Place's). *Arnoux*, R. C. R. 116 (1893) 508.

### 3100 Heterogeneous Media

- stereoscopic, Zeiss's. *Pulfrich, C.* [1899] *Pa. Z.* 1 (1900) 98-.  
—, —. *Frank, K.* *Cztg. Opt.* 21 (1900) 18-.  
theory. *Lorber, F.* *Z. Instk.* 7 (1887) 89-.  
—, —. *Goedseels, —.* *Brux. S. Sc. A.* 21 (1897) (Pt. 1) 110-.

- Telemetrical spherometer and focometer. *Stroud, W.* [1897] *L. Ps. S. P.* 16 (1899) 1-, 206; *Ph. Mg.* 45 (1898) 91-.  
Telastereoscope. *Helmholtz, H.* *Pogg. A.* 101 (1857) 494-; 102 (1857) 167-.  
Testing cannon, optical method. *Jobin, —.* *Par. S. Ps. Sé.* (1897) 9-.  
Total reflection method, application to micro-metric measurement of dispersion. *Pulfrich, C.* *Z. Instk.* 18 (1893) 267-.  
— — —, — — small and imperfect crystal faces. *Pulfrich, C.* *Z. Instk.* 19 (1899) 4-, 79-.  
— — —, — — — — — — — — — — — (Pulfrich).  
*Leiss, C.* *Z. Instk.* 19 (1899) 77-.  
Typoscope. *Emsmann, H.* *Pogg. A.* 115 (1862) 157-.  
Universal optical apparatus. *Rosenberg, V. L.* *Rs. Ps.-C. S. J.* 18 (Ps.) (1886) 168-; *Z. Instk.* 7 (1887) 323-.  
Vertical vibration, arrangement for avoiding. *Julius, W. H.* [1897] *Z. Instk.* 18 (1898) 86-.  
Zoetrope and its antecedents. *Carpenter, W. B.* *Stud.* 1 (1868) 427-; 2 (1869) 24-.

### 3100 Transmission through Heterogeneous Media.

(See also 3210.)

- Curvature of path of ray, free paths. *Everett, J. D. B. A. Rp.* (1889) 498-.  
Curvilinear rays, application to diffusion and conduction. *Wiener, O. A. Ps. C.* 49 (1893) 105-.  
—, Maxwell's problem. *Matthiessen, L. Exner Rpm.* 24 (1888) 401-.  
Heterogeneous cylinders, law of refraction. *Schwarz, A. Exner Rpm.* 21 (1885) 702-.  
— glass, effects. *Laurent, L. Par. S. Ps. Sé.* (1886) 114-.  
— lenses, formula. *Exner, K. A. Ps. C.* 28 (1886) 111-; 29 (1886) 484-.  
— liquid, refractive index. *Littlewood, T. H. L. Ps. S. P.* 13 (1895) 74-; *Ph. Mg.* 37 (1894) 487-.  
— medium, isotropic, principle of least time. *Boussinesq, J. C. R.* 129 (1899) 905-.  
— —, —, propagation of parallel limited beam. *Boussinesq, J. C. R.* 129 (1899) 859-.  
— —, —, wave-propagation. *Boussinesq, J. C. R.* 129 (1899) 794-.  
— —, transparent, movement of light in. *Gergonne, J. D. Gergonne A. Mth.* 19 (1828-29) 257-.  
— —, wave-propagation. *Breton, P.* [1869] (XII) *Isère S. Bll.* 2 (1870) 83-.  
Light penetration in Lake of Geneva and Mediterranean. *Forel, F. A. Sch. Nf. Gs. Vh.* (1884-85) 55.

### Spectrum Apparatus 3150

#### SPECTRUM ANALYSIS, APPARATUS FOR.

#### 3150 General.

- Cylindrical lenses in spectroscopy. *Schönn, L.* [1871] *A. Ps. C.* 144 (1872) 334-.  
Fluor-spar, use in optical instruments. *Thompson, S. P.* [1890] *Ph. Mg.* 31 (1891) 120-.  
Graduated arc in spectrum analysis, and distortion of spectrum. *Wilson, J. M. Ph. Mg.* 22 (1881) 364-.  
Liquids of great dispersive power, use. *Zenger, C. V. C. R.* 100 (1885) 731-.  
Luminous radiations, analysis. *Thirion, J. Rv. Quest. Sc.* 43 (1898) 524-; 44 (1898) 140-, 488-.  
Optical notes. *Talbot, W. H. F.* (vi *Adds.*) *Ph. Mg.* 4 (1834) 112-, 289-.  
Reflectors in spectroscopy. *Fleck, H. J. Pr. C.* 111 (1871) 352-.  
Spectra, bands in, measurement of position. *Sorby, H. C. M. Mer. J.* 14 (1875) 269-.  
—, compared, elimination of errors of adjustment for. *Stokes, (Sir) G. G. R. S. P.* 31 (1881) 470-.  
—, graphic method of drawing. *Dodgson, W.* [1876] *Manch. Lt. Ph. S. Mm.* 6 (1879) 20-.  
— of metals, new method for mapping. *Crew, H., & Tatnall, R. As. & Asps.* 13 (1894) 741-.  
— — —, projection. *Cooke, J. P. Am. J. Sc.* 40 (1865) 243-.  
— — —, —, modification of electric lamp. *Bickerton, A. W. N. Z. I. T.* 7 (1874) 403-.  
— — —, —, objective. *Edelmann, T. D. Nf. Tbl.* (\*1872) 114-.  
— — —, —, and reversal. *Boudréaux, —.* *Par. S. Ps. Sé.* (1874) 101-.  
—, methods of observing and mapping. *Watts, W. M. B. A. Rp.* (1881) 317-.  
—, prismatic and diffraction-, projection of Fraunhofer lines. *Draper, J. C. Am. J. Sc.* 9 (1875) 22-.  
—, —, method of measuring. *Edser, E., & Butler, C. P. L. Ps. S. P.* 16 (1899) 207-; *Ph. Mg.* 46 (1898) 207-.  
—, production and observation. *Prytz, K. Ts. Ps. C.* 29 (1890) 245-.  
— by projection. *Janssen, J. Rm. At.* 16 (1862-63) 482-.  
—, projection, apparatus for. *Pellin, —.* *Par. S. Ps. Sé.* (1888) 305-.  
—, —, best arrangement for. *Maxwell, J. C.* [1868] *Edinb. R. S. P.* 6 (1869) 238-.  
—, —, objective. *Bode, P. Frkf. a. M. Ps. Vr. Jbr.* (1891-92) 29-.  
—, spark-, of solutions, discharger for. *Dennis, L. M. Am. C. S. J.* 20 (1898) 1-.  
Spectrograph with concave mirror. *Ebert, H. Erlang. Ps. Md. S. Sb.* 21 (1890) 1-.  
— — liquid prism. *Lohse, O. Z. Instk.* 5 (1885) 11-.  
Spectrographs, construction and adjustment. *Hartmann, J. Z. Instk.* 20 (1900) 17-, 47-.  
—, 2 forms. *Ebert, H. A. Ps. C.* 38 (1889) 489-.

- Spectrographs, quartz, new. *Leiss, C. Z.* Instk. 17 (1897) 321-, 357-.
- , —, and new auxiliary apparatus. *Leiss, C. Z.* Instk. 18 (1898) 325-.
- Spectrophotographs, stars, sun and gases. *Gothard, J.* [1891] *Mag. Tud. Ak. Étk. (Termt.)* 21 (1892) No. 2, 31 pp.; *Mth. Nt. B. Ung.* 9 (1892) 67-.

## SPECTROSCOPES.

- Regnault, V.* [1847] *Science* 5 (\*1897) 409-.
- Janssen, J.* *Rm. At.* 16 (1862-63) 78-.
- Littrow, O. von.* *Wien SB.* 47 (*Ab.* 2) (1868) 26-.
- Reicroth, H.* *Fresenius Z.* 3 (1864) 443-.
- Börsch, (Dr.) [A.]* *A. Ps. C.* 129 (1866) 384-.
- Voit, C.* *Carl Rpm.* 1 (1866) 65-.
- Poleck, T.* [1866] *Bresl. Jbr. Schl. Gs.* 46 (1869) 28-.
- Christiansen, C.* *A. Ps. C.* 141 (1870) 470-.
- Young, C. A.* *Franklin I. J.* 60 (1870) 331-.
- Stoney, G. J.* [1871] *Ir. Ac. P.* 1 (1873-74) 208-.
- Zenger, C. W.* *Ph. Mg.* 46 (1873) 439-.
- Vogel, H. W.* *D. Nf. B.* (\*1877) 133.
- Living, G. D.* [1879] *Camb. Ph. S. P.* 3 (1880) 260-.
- Scheiner, J.* *Z. Instk.* 12 (1892) 365-; 14 (1894) 316-.
- Pulfrich, C.* *Z. Instk.* 14 (1894) 354-.
- (Littrow's, improved form.) *Wadsworth, F. L. O.* *Ph. Mg.* 38 (1894) 137-.
- and applications. *Casares Gil, J.* [1895] *Barcel. Ac. Mm.* 2 (1892-1900) 177-.
- automatic. *Browning, J.* *As. S. M. Not.* 30 (1870) 198-.
- (Browning's). *Proctor, R. A.* *As. S. M. Not.* 30 (1870) 215-.
- *Grubb, H.* [1870] *As. S. M. Not.* 31 (\*1871) 36-.
- *Krüß, H.* [1884-90] *Hamb. Mth. Gs. Mt.* 1 (1889) 112; *Z. Instk.* 5 (1885) 181-, 232-; 10 (1890) 97-; *Hamb. Mth. Gs. Mt.* 2 (1890) (*Festschr., Tl.* 2) 153-.
- , curve traversed by prism. *Proctor, R. A.* *As. S. M. Not.* 31 (1871) 245-.
- , double. *Proctor, R. A.* *As. S. M. Not.* 31 (1871) 205-.
- , with fixed telescope. *Krtles, H.* *Z. Instk.* 8 (1888) 388-.
- , micrometer. *Baily, W.* *Ph. Mg.* 1 (1876) 314-.
- motion for. *Baily, W.* *Ph. Mg.* 4 (1877) 100-.
- , with second battery of prisms. *Proctor, R. A.* *As. S. M. Not.* 31 (1871) 47-.
- binocular, etc. *Stoney, G. J.* *B. A. Rp.* (1879) 292.
- *Pellin, —.* *As. Fr. C. R.* (1889) (*Pt.* 1) 258-.
- , for faint spectra. *Burton, C. E.* [1874] *Ir. Ac. P.* 2 (1877) 42-.
- collimating eyepiece in. *Dewar, J., & Living, G. D.* *Camb. Ph. S. P.* 4 (1883) 336-.
- collimator, adjustment. *Schuster, A. L.* *Ps. S. P.* 3 (1880) 14-; *Ph. Mg.* 7 (1879) 95-.
- , —. *Lippmann, G.* *C. R.* 129 (1899) 569-.
- comparable scales for spectra. *Weinhold, A.* *A. Ps. C.* 138 (1869) 417-.
- comparison-, for laboratory use. *Pulfrich, C. Z.* *Instk.* 18 (1898) 381-.
- of results, possibility. *Gottschalk, F. A.* *Ps. C.* 121 (1864) 64-.
- construction. *Rutherford, L. M.* *Am. J. Sc.* 39 (1865) 129-.
- (Rutherford). *Ditscheiner, L.* *Wien Sb.* 52 (1866) (*Ab.* 2) 563-.
- without deviation, with 1 or 2 prisms, construction. *Radau, R.* *Carl Rpm.* 2 (1867) 241-.
- diffraction-. *Vogel, H. C.* (*xii*) *Z. Instk.* 1 (1881) 20-, 47-.
- *Olsen, H.* *Z. Instk.* 18 (1898) 280-.
- , method of observing faint lines. *Hartley, W. N.* *Dubl. S. Sc. P.* 4 (1885) 206.
- Direct Vision Spectroscopes.*
- Tait, P. G.* [1871] *Edinb. B. S. P.* 7 (1872) 410-.
- Ricco, A.* *Spet. It. Mm.* 5 (1876) 117-.
- Thollon, L.* *C. R.* 86 (1878) 329-, 595-; *Par. S. Ps.* 86 (1878) 52-.
- Dewar, J., & Living, G. D.* *R. S. P.* 28 (1879) 482-.
- Ricco, A.* *Nap. I. Inc. At.* 16 (1879) 243-; *Spet. It. Mm.* 8 (1879) 21-.
- Zenger, K. V.* *Spet. It. Mm.* 10 (1881) 236-.
- Biese, E.* *Helsingf. Öfv.* 24 (1882) 30-.
- Living, G. D., & Dewar, J.* *R. S. P.* 41 (1887) 449-.
- (Curties's.) *Anon.* *Mer. S. J.* (1899) 337.
- calcite. *Zenger, K. V.* *C. R.* 93 (1881) 720-.
- double internal reflection. *Herschel, A. S.* *Intell. Obs.* 7 (1865) 444-.
- high dispersion. *Thollon, L.* *Par. S. Ps.* 86 (1879) 27-.
- with liquid prisms. *Zenger, K. V.* *C. R.* 92 (1881) 1503-; (*xii*) *Z. Instk.* 1 (1881) 268-.
- powerful. *Zenger, K. V.* *C. R.* 96 (1883) 1039-.
- (Zenger's). *Goodnow, H. R.* *Science* 1 (\*1883) 601.
- with one prism. *Browning, J.* *B. A. Rp.* 34 (1864) (*Sept.*) 9.
- — —. *Emsmann, H.* *A. Ps. C.* 150 (1878) 636-.
- without prism or grating. *Govi, G.* *Nap. Rd.* 24 (1885) 139-.
- slit or collimator. *Zenger, K. V.* *Z. Instk.* 6 (1886) 59-.
- with electric illumination. *Gothard, J.* [*E. von.*] *Cztg. Opt.* 6 (1885) 1-.
- fixed arm. *Wadsworth, F. L. O.* *Ph. Mg.* 38 (1894) 337-.
- with fixed deviation. *Goltzsch, H.* *Carl Rpm.* 18 (1882) 188-.
- — —. *Broca, A., & Pellin, P.* *As. Fr. C. R.* (1898) (*Pt.* 1) 117.
- — —. *Pellin, P., & Broca, A.* *Par. S. Ps.* 86 (1899) 24-.
- half-prism, theory. *Christie, W. H. M.* *R. S. P.* 26 (1877) 8-.

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of high dispersion. *Cornu, A.* Par. S. Ps. S6. (1882) 165-.

imperfections and their remedies. *Ponton, M.* QJ. Sc. 2 (1872) 47-.

improved. *Cooke, J. P. (jun.)* C. N. 8 (1863) 8.

— *Steinheil, C. A. von.* Münch. Sb. 1 (1863) 47-.

— *Grubb, T. R. S. P.* 22 (1874) 308-.

— *Madan, H. G.* Ph. Mg. 48 (1874) 116.

— (*Grubb*). *Stokes, (Sir) G. G.* R. S. P. 22 (1874) 309-.

with inclined slit, image rectified by right-angled prism. *Garbe, P.* Par. S. Ps. S6. (1883) 59-.

— — — — — *Thollon, L. C. R.* 96 (1883) 642-.

— — — — — (*Thollon*). *Garbe, P.* C. R. 96 (1883) 836-.

increasing dispersion in. *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 6 (1890) (Sem. 2) 195-.

as instruments of precision. *Oppio, L. dall'.* Ven. I. At. 1 (1883) 953-.

intensity of light. *Lippich, F.* A. Ps. C. Beibl. 5 (1881) 585-.

*Ladd's*. *Mascart, É.* [1873] Par. S6. S. Ps. 1 (1878-74) 93-.

without lens. *Braham, P.* B. A. Rp. (1889) 544.

micrometer eyepiece for. *Rood, O. N.* Carl Rpm. 10 (1874) 67-.

— for spectroscopic analysis. *Watts, W. M.* L. Ps. S. P. 1 (1876) 160-; Ph. Mg. 50 (1875) 81-.

and microspectroscope with telescope. *Marpmann, G.* Z. Angew. Mkr. 5 (1900) 309-.

objective. *Merz, S.* Carl Rpm. 6 (1870) 164-.

optical investigations with special reference to. *Rayleigh, (Lord).* Ph. Mg. 8 (1879) 261-, 403-, 477-; 9 (1880) 40-.

optics. *Seabroke, G. M.* Nt. 10 (1874) 467-.

passage of light through. *Hoorweg, J. L.* Utr. Prv. Gn. Aant. (1874) 20-; A. Ps. C. 154 (1875) 423-.

pocket-. *Simmler, R. T.* Bern Mt. (1863) 62-.

—, measuring scales. *Herschel, A. S.* Nt. 18 (1878) 300-.

with 11 prisms. *Gassiot, J. P.* R. S. P. 13 (1864) 183-.

— 9 prisms, achromatic telescopes, etc. *Gassiot, J. P.* [1863] (vii) Ph. Mg. 27 (1864) 143-.

prisms, train of. *Cooke, J. P.* Am. J. Sc. 40 (1865) 305-.

reflection-. *Lippich, F.* Z. Instk. 4 (1884) 1-.

registering. *Huggins, W.* R. S. P. 9 (1871) 817-.

with rotating grating. *Lehmann, H.* Z. Instk. 20 (1900) 193-.

scales. *Chapman, E. J.* (xii) Cn. R. S. P. & T. 1 (1883) (Sect. 3) 55-.

simple. *Osann, G.* Würzb. Nw. Z. 4 (1863) 1-.

— *Kessler, F.* A. Ps. C. 151 (1874) 507-.

— form for lectures. *Cushman, H.* Science 3 (1896) 45-.

simplification. *Hüfner, C. G.* Carl Rpm. 15 (1879) 116-.

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alt. *Wadsworth, F. L. O.* Am. J. Sc. 48 (1894) 19-.

—, adjustable, simple form. *Tisley, S. C.* B. A. Rp. (1874) (Sect.) 27.

—, symmetrical, Vierordt's. *Leiss, C.* Z. Instk. 18 (1898) 116-.

spectroscopic combination, new. *Fievez, C.* Leip. As. Gs. Vjschr. 16 (1881) 311-.

theory. *Ditscheiner, L.* A. Ps. C. 129 (1866) 386-.

for ultra-violet. *Cornu, A.* Par. S. Ps. S6. (1879) 39-.

uniformity in spectroscopic measurements. *Steinheil, C. A. von.* A. Ps. C. 122 (1864) 167-.

Spectrum analysis, main points. *Arneberg, A.* Ts. Ps. C. 24 (1885) 321-, 353-; 27 (1888) 65-.

—, bands in, measuring and recording. *Palmer, T. M.* Mer. J. 16 (1876) 277-.

— camera, applications. *Crookes, W.* Pht. S. J. 2 (1856) 292-.

—, conditions for length. *Dolbear, A. E.* Am. Ac. P. 21 (1886) 361-.

—, curvature of lines. *Ditscheiner, L.* Wien Sb. 51 (1865) (Ab. 2) 368-.

—, dispersion-, curvature of lines. *Christie, W. H. M.* As. S. M. Not. 34 (1874) 263-.

—, lines. *Rachinskii, K. A.* (xii) Rec. Mth. (Moscou) 2 (1867) (Pt. 1) 317-.

—, —, feeble, arrangement for measuring. *Vogel, H. C.* (xii) Z. Instk. 1 (1881) 20-, 47-.

—, longitudinal rays. *Babinet, J.* (vi Add.) C. R. 35 (1852) 413-.

—, —. *Porro, I.* C. R. 35 (1852) 479-.

—, Newton's method of observation. *Kahlbaum, G. W. A.* Basel Vh. 8 (1890) 884-.

—, photographing whole length at once. *Liveing, G. D.* Camb. Ph. S. P. 9 (1898) 141-.

— photography, simple apparatus. *Vogel, H. W.* A. Ps. C. 154 (1875) 306-.

—, solar, dark lines, apparatus for observing. *Dujardin, F.* C. R. 8 (1889) 253-.

—, —, fixed lines. *Cooper, J. T.* R. I. J. 2 (1831) 289-.

—, —, longitudinal lines. *Ragona-Scinà, D.* Palomba Rac. 3 (1847) 289-; Pogg. A. 84 (1851) 590-.

## 3155 Prisms.

Prism combinations with coincident direct and emergent rays. *Herschel, (Sir) J. F. W.* Les Mondes 3 (1863) 403-.

—, defect of image of interference bands when seen through. *Straubel, R.* A. Ps. C. 66 (1898) 346-.

—, direct vision. *Fuchs, F.* (xii) Z. Instk. 1 (1881) 326-, 349-.

—, —. *Braun, K.* (xii) Mth. Term. Éts. 1 (1883) 219-; Mth. Nt. B. Ung. 1 (1882-83) 197-.

—, —, of high dispersion. *Thollon, L.* C. R. 88 (1879) 80-.

—, liquid, for spectroscope. *Wernicke, K. W.* (xii) Z. Instk. 1 (1881) 353-.

3160 Gratings. *Concave*

## Special Spectroscopic Apparatus 3165

- Prism of variable angle. *Melander, G.* Helsingf. Öfv. 40 (1898) 82-.
- Prisms, aberrations, effect. *Crova, A.* [1882] Mntp. Ac. Mm. 10 (1884) 265-.
- , carbon disulphide. *Marlow, G.* C. N. 13 (1866) 28.
- , —, use. *Barker, G. F., & Draper, H.* Am. J. Sc. 29 (1885) 289-.
- , —, —. *Smyth, C. P., & Herschel, A. S.* B. A. Rp. (1885) 942-.
- , —, —. *Hasselberg, B.* A. Ps. C. 27 (1886) 415-.
- , dispersion-parallelepiped, construction and applications. *Zenger, K. V.* Prag Sb. (1881) 416-; As. Fr. C. R. (1883) 298-.
- , error of train. *Zech, P.* Carl Rpm. 2 (1887) 106-.
- of flint glass and carbon disulphide for spectral analysis. *Rood, O. N.* Silliman J. 35 (1863) 358-.
- , liquid, for spectroscopes, etc. new form. *Hardie, W. M.* [1886] Sc. S. Arts T. 11 (1887) 358-.
- , liquids for. *Hartley, W. N.* Nt. 44 (1891) 273.
- , reflecting, with constant deviation. *Bauernfeind, C. M.* Münch. Sb. (1865) (2) 344-; (1868) (1) 495-.
- , refraction-, new shape. *Cornu, F.* Laus. S. Vd. Bll. 33 (1897) xxxiv-.

## 3160 Gratings.

(See also 3630.)

- Quincke, G.* A. Ps. C. 146 (1872) 1-.
- Blake, J. M.* Am. J. Sc. 8 (1874) 33-.
- Thorp, T.* Manch. Mer. S. T. (1894) 26-.
- coefficient of expansion, determination by means of spectrum. *Mendenhall, T. C.* Am. J. Sc. 21 (1881) 230-.

## CONCAVE GRATINGS.

- Rowland, H. A.* Ph. Mg. 13 (1882) 469-; Am. J. Sc. 26 (1883) 87-.
- diffraction spectra with, experimental arrangement. *Rizzo, G. B.* Tor. Ac. Sc. Aw 34 (1898) 794- or 1062-.
- Rowland's.* *Glazebrook, R. T.* L. Ps. S. P. 5 (1884) 243-; Ph. Mg. 15 (1883) 414-; 16 (1883) 377-.
- *Mascart, É. É. N.* J. de Ps. 2 (1883) 5-.
- *Waterhouse, (Lt.-Col.) J.* Beng. As. S. P. (1889) 3-.
- , absolute measurements of rulings at 62° F. *Rogers, W. A.* Am. S. Mer. P. (1885) 151-.
- , astigmatism. *Sirks, J. L.* Amst. Ak. Vh. (Sect. 1) 2 (1894) No. 6, 7 pp.
- , asymmetry in. *Rydberg, J. R.* Stockh. Ak. Hndl. Bh. 18 (Afd. 1) (1893) No. 9, 12 pp.
- , comparison of 2. *Bruère, (Miss) A. H.* Ps. Rv. 3 (1896) 301-.
- , mode of erection. *Haga, H.* A. Ps. C. 57 (1896) 389-.

- Rowland's,* spectrum photography with. *Waterhouse, (Lt.-Col.) J.* Spet. It. Mm. 18 (1890) 14-.
- spectra. *Baily, W. L.* Ps. S. P. 5 (1884) 181-; Ph. Mg. 15 (1883) 183-.
- in stellar photography. *Poor, C. L., & Mitchell, S. A.* J. H. Un. Cir. [17 (1897-98)] 61-.
- theorem. *Baily, W. L.* Ps. S. P. 8 (1887) 53-; Ph. Mg. 22 (1886) 47-.
- theory. *Sokolov, A. P.* (XII) Ra. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 293-.
- *Mitchell, S. A.* J. H. Un. Cir. [17 (1897-98)] 56-.
- , adjustments and use. *Ames, J. S.* J. H. Un. Cir. 8 (1888-89) 69-.

- echelon film. *Butler, C. P.* Nt. 61 (1899-1900) 275.
- films, with application to colour photography. *Thorp, T.* Manch. Lt. Ph. S. Mm. & P. 44 (1900) No. 12, 8 pp.
- large, machine for ruling. *Mallock, A. B. A.* Rp. (1882) 466-.
- manufacture and theory. *Rayleigh, (Lord).* Ph. Mg. 47 (1874) 81-, 193-; 11 (1881) 196-.
- — — *Rowland, H. A.* Ph. Mg. 13 (1882) 469-.
- on metal, photography. *Izarn, —.* C. R. 116 (1893) 794-.
- photographic reproduction. *Rayleigh, (Lord).* R. S. P. 20 (1872) 414-; B. A. Rp. 42 (1872) (Sect.) 89-.
- — — *Izarn, —.* C. R. 116 (1893) 506-.
- — — *Rayleigh, (Lord).* Nt. 54 (1896) 332-.
- plane, formulæ. *Branly, E. J.* de Ps. 5 (1886) 73-.
- as ruled at Johns Hopkins University. *Anon.* J. H. Un. Cir. 8 (1888-89) 79.
- use. *Rowland, H. A.* J. H. Un. Cir. 8 (1888-89) 73-.

## 3165 Special Spectroscopic Apparatus.

- Blood, apparatus for spectroscopic analysis. *Hénocque, A.* Par. S. Bl. Mm. 38 (1886) (C.R.) 445-; Par. S. Ps. S6. (1887) 83-.
- , etc., spectrocolorimeter for. *Arsonval, — d'.* Par. S. Ps. S6. (1890) 109.
- , spectroscopes for detection of (héma-spectroscopes). *Thierry, M. de.* C. R. 100 (1885) 1244-; 120 (1895) 775-.
- Bolometer, iron-wire, for investigation of heat-spectra. *Edelmann, M. T.* Elekttech. Z. 15 (1894) 81-.
- Bolometric arrangements. Absorption of long wave radiation by carbon dioxide. *Kurlbaum, F.* A. Ps. C. 61 (1897) 417-.
- investigations in grating spectra. *Paschen, F.* A. Ps. C. 48 (1893) 272-.
- Double prism arrangement for viewing sun by light of any desired wave-length. *Harkness, —.* Smiths. Misc. Col. 33 (1888) Art. 4, 13 (bis)-. (Wash. Ph. S. Bll. 10 (1888).)



## 3165 Spectroscopes

## Optics of the Atmosphere. Mirage 3200

- Gases and vapours of sun, comparison of apparatus and methods employed in study. *Deslandres, H.* Spet. It. Mm. 23 (1895) 141 (bis)-.
- Interference, spectral, lecture experiments. *Lommel, E. von.* Münch. Ak. Sb. 23 (1894) 133-.
- , spectroscopy by. *Perot, A., & Fabry, C.* C. R. 126 (1898) 34-, 331-, 407-.
- in spectroscopy, theory, and applications of new method. *Fabry, C., & Perot, A.* A. C. 16 (1899) 115-.
- Interferometer, spectral. *Zenker, W.* Z. Instk. 7 (1887) 1-.
- Luminous and chromatic intensities of spectral colours and their mixtures, apparatus for studying. *Parinaud, —.* Par. S. Ps. Sé. (1884) 206-.
- Monochromatic light of desired wave-length, instrument for. *Tutton, A. E.* Z. Kr. 24 (1895) 455-.
- , spectral apparatus for producing. *Wulffing, E. A.* N. Jb. Mn. (Beil.-Bd.) 12 (1899) 343-.
- Photography of short wave-lengths. *Schumann, V.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 415-, 625-.
- Polyoptometer. *Porro, I.* C. R. 35 (1852) 433.
- Spectral apparatus, rotating, for solar observations. *Lohse, O.* (XII) Z. Instk. 1 (1881) 22-.
- illuminator. *Leroux, F. P.* C. R. 76 (1873) 998-.
- SPECTROSCOPES.
- comparison-, for colour technique. *Pulfrich, C.* Z. Instk. 20 (1900) 299-.
- crystal. *Zenger, K. V.* D. Nf. Tbl. (1888) 19-.
- with divided grating. *Lockyer, J. N.* R. S. P. 39 (1886) 416-.
- echelon. *Mann, C. R.* Science 8 (1898) 208-.
- *Michelson, A. A.* Asps. J. 8 (1898) 37-.
- (Michelson's). *Butler, C. P.* Nt. 59 (1898-99) 607-.
- *Michelson, A. A.* Am. Ac. P. 35 (1900) 109-.
- , behaviour of chief lines in mercury spectrum under influence of magnetic field. *Blythwood, (Lord), & Marchant, E. W.* Ph. Mg. 49 (1900) 384-, 503.
- for examination of absorption in considerable thickness of liquids. *Thierry, M. de.* C. R. 101 (1885) 811-.
- — great thicknesses of liquids. *Thierry, M. de.* C. R. 120 (1895) 775-.
- with fluorescent eye-piece. *Soret, J. L.* As. Fr. C. R. 2 (1873) 197-; A. Ps. C. (Jubelbd.) (1874) 407-; Arch. Sc. Ps. Nt. 57 (1876) 319-.
- for measuring extinction coefficients. *Schottländer, P.* Z. Instk. 9 (1889) 98-.
- with phosphorescent eye-piece. *Lommel, E. C. J.* [1883] Münch. Ak. Sb. 13 (1884) 408-.
- to rationalise spectra. *Gramont, A. de.* C. R. 128 (1899) 1564-.
- reversion-. *Zöllner, F.* Leip. B. 21 (1869) 70-.

- reversion-, *Zöllner's.* *Faye, H. A. É.* C. R. 69 (1869) 689-.
- rigid, observation of lines of spectrum with varying terrestrial gravity. *Gassiot, J. P.* R. S. P. 14 (1865) 320-; 16 (1868) 6-.
- rotatory polarisation-, with great dispersion. *Tait, P. G.* Nt. 23 (1880) 360-.
- use of birefringent eye-piece in. *Cruik, L.* C. R. 96 (1883) 1298-.
- for watching progress of operations in Bessemer converter, etc. *Zenger, K. V.* C. R. 101 (1885) 1005.

## OPTICS OF THE ATMOSPHERE.

## 3200 General

- Babinet, J.* C. R. 4 (1837) 638-.
- Éval'd, T. T.* [1873] (XII) Rs. C. Ps. S. J. 6 (Ps.) (1874) [Pt. 1] 22-.
- Barber, S.* J. Sc. 4 (1874) 34-.
- Abendroth, W.* Dresden Erdk. Jbr. 15 (1878) (Sb.) 40-.
- Rovelli, C.* Rv. Sc.-Ind. [24 (1892)] 71-.
- Air-mirror, Grey's, and related phenomena. *Schrank, F. von P. von.* Münch. D. (1808) 299-.
- Appearances of sun near horizon. *Maggi, P. G.* Ven. At. 3 (1852) 186-.
- Atmospheric reflection. *Streintz, H.* Wien Pht. Cor. 29 (1892) 225-.
- Clouds, artificial, effect on sunlight. *Kiessling, J.* Gött. Nr. (1884) 226-; Hamb. Nt. Vr. Ab. 8 (1884) No. 5, 8 pp.; Met. Z. 1 (1884) 83, 117-.
- after sunset, luminous phenomenon by total reflection. *Salm Horstmar, W. F.* Pogg. A. 104 (1858) 647-.
- Colour phenomena from solar eclipse observations, U.S.A., July 29, 1878. *Abbe, C.* [U.S.] Chief Sig. Off. A. Rp. (\*1880) 834-.
- Darkness in caverns. *Calderon y Arana, S.* Madrid S. H. Nt. A. 7 (1878) (Act.) 56-.
- — — (Tyndall's optical vacuum and propagation of light, experiments). *Calderon y Arana, S.* [1886] Par. S. Gl. Bil. 15 (1887) 36-.
- Diffused light at Havana, chemical action. *Poey, A.* Fr. S. Mét. An. 11 (\*1863) Pt. 2, 90-.
- Luminous intensity of sun and sky, relation between. *Majorana, Q.* Rm. R. Ac. Linc. Rd. 9 (1900) (Sem. 2) 87-.
- matter in atmosphere. *Waldner, H.* Nt. 5 (1872) 304-.
- MIRAGE.
- Everett, J. D.* Ph. Mg. 45 (1873) 161-, 248-.
- Tait, P. G.* Edinb. B. S. T. 30 (1883) 551-; Nt. 28 (1883) 84-.
- Macé de Lépinay, J., & Perot, A.* A. C. 27 (1892) 94-.
- MacMahon, (Maj.) P. A.* Nt. 59 (1898-99) 259-.
- caustic. *Macé de Lépinay, —.* As. Fr. C. R. (1891) (Pt. 1) 187.

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on city pavements. *Wood, R. W.* Nt. 58 (1898) 596.  
and its interference phenomena, artificial production. *Macé de Lépinay, J., & Perot, A.* C. R. 108 (1889) 1043-  
on Starnberg Lake. *Lingg, F.* Ac. Nt. C. N. Acta 55 (1891) 1-  
theory. *Gergonne, J. D.* [1829] *Gergonne A. Mth.* 20 (1829-30) 1-  
— *Grunert, J. A.* *Grunert Met. Opt.* 1 (1848) 267-  
—, *Biot's Macé de Lépinay, J.* J. de Ps. 2 (1893) 320-  
— of elevation or depression of objects on horizon. *Gruber, T.* *Gilbert A.* 3 (1800) 439-  
and tornadoes, artificial, experiments. *Wood, R. W.* Ph. Mg. 47 (1899) 349-.

Optical illusions in high altitudes. *Böhm, A.* D. Alpvr. Z. 13 (1882) 161-  
— — — *Heyn, R.* [1896] *Dresden Erdk. Jbr.* 26 (1896) 3-  
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— — — *Heger, R.* *Dresden Isis Sb.* (1898) 23-  
— at summit of Canigou. *Ratheau, A.* *Perpignan Mm. S. Ag. Pyr. Orient.* 13 (1863) 172-  
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*Groombridge, S.* *Phil. Trans.* (1810) 190-; (1814) 337-  
*Young, (Dr.) T.* [1819] *QJ. Sc.* 11 (1821) 353-  
*Ivory, J.* *Tilloch Ph. Mg.* 57 (1821) 321-; 404-; 58 (1821) 161-  
(*Ivory, J.*) *Young, (Dr.) T.* *QJ. Sc.* 12 (1822) 390-  
*Transon, (Prof.) A.* *Par. S. Phlm. PV.* (1841) 21-  
*Murphy, R.* *Ph. Mg.* 20 (1842) 310-  
*Baeyer, J. J.* *As. Nr.* 41 (1855) 305-; *St. Pét. Ac. Mm.* 3 (1861) 82 pp.  
*Kummer, E. E.* [1860] *Berl. Mb.* (1860) 405-; *Crelle J.* 61 (1863) 263-  
*Seeliger, H.* *Münch. Ak. Sb.* 21 (1892) 239-  
*Ekama, H.* [1893] *Mbl. Nt.* (1893-94) 16-; *J. de Ps.* 2 (1893) 74-  
*Wiener, —.* [1893] *Karlsruhe Nt. Vr. Vh.* 11 (1896) (Sb.) 220-  
*Gleichen, A.* [1899] *D. Ps. Gs. Vh.* (1900) 24-.

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apparent changes of place, colour, size and figure of heavenly bodies. *Jordan, G. W.* *QJ. Sc.* 10 (1821) 9-  
— magnitude of objects caused by. *Mile, J.* *J. de Ps.* 95 (1822) 321-  
appearance of terrestrial objects due to. *Mayer, J. T.* [1810] *Gött. Cm.* 1 (1808-11) 48 pp.

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*Klügel, G. S.* [1801] *Bode As. Jb.* (1804) 198-  
*Delambre, J. B. J.* *Con. des Temps* (1818) 382-  
*Ivory, J.* *Phil. Trans.* (1823) 409-; *Tilloch Ph. Mg.* 63 (1824) 418-  
*Atkinson, H.* [1825] *As. S. Mm.* 2 (1826) 137-  
*Ivory, J.* *As. Nr.* 12 (1835) 110-  
*Biot, J. B.* [1836] *C. R.* 3 (1836) 237-; *Con. des Temps* (1839) 3-  
*Bessel, F. W.* *C. R.* 15 (1842) 181-  
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*Faye, H. A. É.* *C. R.* 39 (1854) 381-  
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(*Biot, J.*) *Faye, H. A. É.* *C. R.* 39 (1854) 481-  
(*Faye, J.*) *Laugier, P. A. E. C. R.* 39 (1854) 521-  
(*Laugier, J.*) *Faye, H. A. É.* *C. R.* 39 (1854) 586-  
(Summary of previous articles.) *Biot, J. B. C. R.* 40 (1855) 597-  
*Heegmann, A.* [1856] (xiii) *Lille S. Mm.* 3 (1857) 177-  
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—, —, *Backhouse*, T. W. [1891] *Sym. Met. Mg.* 26 (1892) 86.

—, —, (*Backhouse*). *Cherrill*, A. K. [1891] *Sym. Met. Mg.* 26 (1892) 101-.

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— *Grunert*, J. A. *Grunert Met. Opt.* 1 (1848) 1-.

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- , —. *Wirtinger, W.* *Innsb. Nt. Md. B.* 23 (1897) 7-.
- , elementary. *Lommel, E. C. J.* *A. Ps. C.* 156 (1875) 578-.
- , experimental illustration. *Pulfrich, C.* *Bonn. Niedr. Gs. Sb.* (1887) 158-; *D. Nf. Tbl.* (1887) 238; *A. Ps. C.* 33 (1888) 194-.
- , and Huygens's principle. *Mascart, É. É. N.* *C. R.* 108 (1889) 16-.
- triple. *Ciccolini, L.* *Zach M. Cor.* 20 (1809) 501-.
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- , *Tyndall, J.* *Ph. Mg.* 17 (1884) 148-.
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- , new theory. *Moigno, F.* [1852] *Moigno Cosmos* 2 (1852-53) 106-.

- Rings, Bishop's, theory. *Pernter, J. M.* *Met. Z.* 6 (1889) 401-.
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- , uncoloured, seen during aeronautic ascents. *Fonvielle, W. de.* *C. R.* 74 (1872) 71.
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(See also 3640, 4010, Meteorology 0510, 0520.)

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- Crosby, W. O.* *Am. Ac. P.* 10 (1875) 425-.
- Pickering, W. H.* *Science* 6 (1885) 316.
- Wyss, G. H. von.* *Zür. Vjschr.* 33 (1888) 279-.
- Actinic rays and sky-light. *Tyndall, J. R. I.* *P.* 5 (1869) 429-.
- Atmosphere and deep waters, colour. *Maistre, X. de.* *Bb. Un.* 51 (1832) 259-.
- steam jet, colours. *Clausius, R.* *Edinb. N. Ph. J.* 54 (1853) 166-.
- , transparency and colour. *Jackson, J. R.* *Bb. Un.* 49 (1832) 163-.
- Blackness. *Saigey, J. F.* *Mon. Sc.* 13 (1871) 259-.
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- , *Tyndall, J.* *R. S. P.* 17 (1869) 223-.
- , *Soret, J. L.* *Arch. Sc. Ps. Nt.* 37 (1870) 180-; 39 (1870) 352-.
- , *Collas, C.* *Les Mondes* 29 (1872) 617-.
- , *Worthington, A. M.* *Ph. Mg.* 6 (1878) 267-.
- , *Pernter, J. M.* *Wetter* 7 (1890) 49-.

- Blue colour. *Spring, W.* *Brux. Ac. Bll.* 36 (1898) 504-; *Ciel et Terre* 19 (1898-99) 537-.
- , *Pernter, J. M.* *Wien Az.* 36 (1899) 163-.
- (Pernter). *Spring, W.* [1899] *Brux. Ac. Bll.* (1899) 441-, 884; *Ciel et Terre* 20 (1899-1900) 177-, 305-.
- (Spring). *Pernter, J. M.* [1899] *Ciel et Terre* 20 (1899-1900) 301-.
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- , origin, and transmission of light through an atmosphere containing small particles in suspension. *Rayleigh, (Lord).* *Ph. Mg.* 47 (1899) 375-.
- reflected by water or air. *Hagenbach, E.* *Arch. Sc. Ps. Nt.* 37 (1870) 176-.
- and transparency of atmosphere. *Hagenbach, E.* *Sch. Gs. Vh.* 52 (1868) 56-.
- Cause of colour. *Budde, E.* *A. Ps. C.* 150 (1873) 576-.
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- Cyanometric observations of de Saussure. *Prevost, P. J.* *J. de Ps.* 57 (1803) 372-.
- Explanation, new. *Nichols, E. L.* *Ph. Mg.* 8 (1879) 425-.
- First purple light, theory. *Pernter, J. M.* *Met. Z.* 7 (1890) 41-.
- Light diffused by the sky, analysis. *Crova, A.* *A. C.* 20 (1890) 480-; *As. Fr. C. B.* (1890) (Pt. 2) 245-; *C. R.* 112 (1891) 1176-; *As. Fr. C. R.* (1891) (Pt. 2) 295-; *A. C.* 25 (1892) 534-; *Met. Z.* 9 (1892) 63-.
- Photographic experiments. *Whitman, F. P.* *Am. As. P.* (1888) 83-.
- Physical science for artists. *Lockyer, J. N.* *Nt.* 18 (1878) 29-, 58-, 87-, 122-, 154-, 223-.
- Spectrophotometric analysis. *Nichols, E. L.* *Am. As. P.* (1885) 78-.
- Steam, colour under certain circumstances. *Forbes, J. D.* *Ph. Mg.* 14 (1839) 121-.
- Sunlight colours. *Langley, S. P.* *Nt.* 36 (1887) 76.
- Sunrise and sunset colours. *Chomel, —.* *C. R.* 25 (1847) 395-.
- — — phenomena. *Battelli, A. N.* *Cim.* 29 (1891) 97-; 30 (1891) 283.
- Sunset colours and Krakatoa eruption. *Symons, G. J.* *Sym. Met. Mg.* 18 (1883) 161-, 187-.
- — — —. *Aitken, J.* *Edinb. B. S. P.* 12 (1884) 448-, 647-.
- — — —. *Flammarion, C.* *As.* (1884) 19-, 58-.
- — — —. *Meißinger, —.* [1884] *Karlsruhe Nt. Vr. Vh.* 10 (1888) (Sb.) 24-.
- , theory. *Lommel, E.* *A. Ps. C.* 131 (1867) 105-.
- Sunsets, red, explanation. *Marangoni, C.* *Rm. R. Ac. Linc. T.* 8 (1884) 268-.
- Twilight glow, optical phenomena. *Marchand, E.* *C. R.* 97 (1883) 1514-.
- tints, theory. *Lommel, E. von.* *Münch. Ak. Ab.* 19 (1899) 449-, 735-.
- Unusual colorations, historical account. *Kießling, J.* *Hamb. Nt. Vr. Ab.* 10 (1887) No. 3, 19 pp.

## POLARISATION.

- Brewster, (Sir) D.* [1863] Edinb. R. S. T. 23 (1864) 211-.
- Rubenson, R.* [1864] Ups. N. Acta S. Sc. 5 (1865) 1-, i-.
- Brewster, (Sir) D.* [1866] Edinb. R. S. T. 24 (1867) 247-.
- Tyndall, J.* R. S. P. 17 (1869) 223-.
- Rayleigh, (Lord).* [1870] Ph. Mg. 41 (1871) 107-, 274-.
- Lallemand, A.* C. B. 75 (1872) 707-.
- Bosanquet, R. H. M.* Ph. Mg. 50 (1875) 497-.
- Soret, J. L.* Sch. Nf. Ga. Vh. 60 (1876-77) 54-.
- Busch, F.* Met. Z. 3 (1886) 582-.
- Soret, J. L.* A. C. 14 (1888) 503-.
- Basso, G.* It. S. Met. An. 4 (1889) 238-.
- McConnel, J. C.* Ph. Mg. 27 (1889) 81-.
- Hurion, A.* C. R. 116 (1893) 795-.
- by air mixed with aqueous vapour. *Haidinger, W. von.* Ph. Mg. 38 (1889) 54-.
- of different colours. *Piltchikoff, N. C. R.* 115 (1892) 555-.
- experiments. *Rosenbach, —.* Bresl. Schl. Gs. Jbr. (1893) (Ab. 2a) 17-.
- *Hintze, —.* Bresl. Schl. Gs. Jbr. (1893) (Ab. 2a) 19-.
- floating matter and light. *Tyndall, J.* Nt. 1 (1870) 499-.
- influence of Earth's magnetism. *Becquerel, H.* C. R. 86 (1878) 1075-; 87 (1878) 1035; 89 (1879) 838-; A. C. 19 (1880) 90-; C. R. 93 (1881) 481-; A. C. 27 (1882) 312-.
- of light reflected by air. *Delezenne, —.* Lille Tr. (1823-24) 34-.
- — — *Quetelet, L. A. J.* Quetelet Cor. Mth. 1 (1825) 275-.
- — — or water. *Hagenbach, E.* [1870-71] Arch. Sc. Ps. Nt. 37 (1870) 176-; Basel Vh. 5 (1873) 503-.
- — — *Soret, J. L.* Arch. Sc. Ps. Nt. 37 (1870) 180-; 39 (1870) 352-.
- moonlight. *Piltchikoff, N. C. R.* 114 (1892) 468-.
- and sunlight. *Zantedeschi, F.* Rm. Bill. Met. 4 (1865) 51-.
- neutral point, Brewster's. *Soret, J. L., & Soret, C.* [1888] C. R. 107 (1888) 621-; Arch. Sc. Ps. Nt. 21 (1889) 28-.
- points, Brewster's, Arago's and Babinet's, comparative visibility. *Chase, P. E.* Ph. Mg. 32 (1866) 156-.
- observations with the new polarimeter of Rubenson. *Thalén, T. R.* Stockh. Öfv. 19 (1862) 29-.
- observed under tropical sky of Havana. *Poey, A.* C. R. 60 (1865) 781-.
- polar clock. *Wheatstone, (Sir) C.* B. A. Rp. (1848) (pt. 2) 10-.

## 3240 Atmospheric Absorption.

(See also 3850; Astronomy 5400.)

- Langley, S. P.* Am. J. Sc. 28 (1884) 163-.
- Absorption by atmospheric carbon dioxide and water vapour. *Ångström, K. A.* Ps. 3 (1900) 720-.

- Absorption of calorific rays by Earth's atmosphere. *Melloni, M.* C. R. 10 (1840) 18-.
- — heat by layers of air of different thickness. *Magnus, G.* Berl. Mb. (1862) 569-.
- — — moist air. *Magnus, G.* Berl. Mb. (1862) 572-.
- — solar radiation by atmosphere, empirical formula for. *Bartoli, A., & Stracciati, E.* N. Cim. 31 (1892) 198-.
- — — clouds. *Bartoli, A., & Stracciati, E.* Mil. I. Lomb. Bd. 27 (1894) 592-.
- Atmospheric absorption and electric light. *Adams, W. G.* Elect. 15 (1885) 862-, 861-.
- —, estimation. *Cornu, A.* C. R. 95 (1882) 801-.
- — of heat-rays, according to experiments made at Amsterdam. *Stamkart, F. J.* Amst. N. Vh. 13 (1848) 27-.
- —, Himalayas. *Schuster, A.* Nt. 13 (1876) 393-.
- — in infra-red. *Abney, (Capt.) W. de W., & Festing, (Col.) —.* R. S. P. 35 (1883) 80-.
- — of light. *Hausdorff, F.* Leip. Mth. Pa. B. 47 (1895) 401-.
- — — *Ricciò, A.* Catania Ac. Gioen. Bll. 53-54 (1893) 2-.
- — — photographic rays. *Schaeberle, J. M.* Lick Obs. Ct. 3 (1893) 89 pp.
- — — ultra-violet radiation. *Cornu, A.* C. R. 88 (1879) 1285-; 90 (1880) 940-; As. Fr. C. R. (1884) (Pt. 2) 103-.
- Balloon ascents, spectroscopic observations. *Fonvielle, W. de.* C. R. 79 (1874) 816-.
- Calorific effects of sun at extremities of Earth's atmosphere. *Saigey, J. F.* Mon. Sc. 13 (1871) 257-.
- Chiaroscuro and optical phenomenon. *Maggi, P. G.* Verona Mm. Ac. Ag. 20 (1842) 53-.
- Constituent of atmosphere absorbing radiant heat. *Hill, S. A.* R. S. P. 33 (1882) 216-, 435-.
- Extinction of light in atmosphere. *Jacob, W. S.* Edinb. R. S. P. 2 (1851) 271-.
- — — (Jacob). *Meech, L. W.* Am. As. P. (1858) 42-.
- — — *Seeliger, H.* Münch. Ak. Sb. 21 (1892) 247-.
- — —, influence of selective absorption. *Hepperger, J. von.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 173-.
- Lighthouses and search lights, failure of electric arcs in fog. *Paul, H. M.* Science 5 (1885) 150-.
- Radiant and absorptive properties of vapour in atmosphere, Tyndall's deductions. *Russell, R.* B. A. Rp. (\*1867) (Sect.) 11.
- Radiation through Earth's atmosphere. *Tyndall, J.* Ph. Mg. 25 (1863) 200-.
- Red glass, effect in rendering objects more visible through mist. *Luvini, J.* L'I. 17 (1849) 8.
- Solar light, change in passing through atmosphere. *Hassenfratz, J. H.* A. C. 66 (1808) 54-.
- — — — (Hassenfratz). *Hatly, R. J.* J. de Ps. 66 (1806) 356-.
- —, chemical intensity at different altitudes of sun. *Barendell, J., & Roscoe, H. E.* [1866] R. S. P. 15 (1867) 20-.

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- Solar light, chemical intensity at different altitudes of sun (Baxendell and Roscoe). *Clausius, R.* Ph. Mg. 32 (1866) 41-.
- , curious effect. *Percival, J. G.* Silliman J. 12 (1827) 164-.
- , diminution of intensity in atmosphere. *Forbes, J. D.* Edinb. R. S. P. 1 (1845) 55-.
- , transmission through Earth's atmosphere. *Abney, (Capt.) W. de W.* [1888-92] Phil. Trans. (A) 178 (1888) 251-; 184 (1894) 1-.
- radiation, influence of water in atmosphere. *Abney, (Capt.) W. de W., & Festing, (Col.)* —. R. S. P. 35 (1888) 328-.
- Spectrum analysis and rain-band. *Jameson, H. G.* [1888] Eastbourne NH. S. T. 2 (1886-94) 62-.
- of atmosphere and that of water vapour. *Janssen, J.* B. A. Rp. 36 (1866) (Sect.) 11.
- Transparency of atmosphere and flames. *Allard, E.* C. R. 81 (1875) 1096-; Par. Mm. Sav. Étr. 25 (1877) No. 2, 48 pp.
- — — — — (Allard). *Becquerel, A. C.* C. R. 82 (1876) 1300-.
- — — instrument to measure (diaphanometer). *Saussure, H. B.* Turin Mm. Ac. 4 (1788-89) 425-.
- — — and law of extinction of solar rays in passing through it. *Forbes, J. D.* Phil. Trans. (1842) 225-.
- — — photometer for. *Delarive, A.* C. R. 64 (1867) 1221-.
- — — probabilities applied to variations in. *Seidel, L.* Münch. Sb. 2 (1863) 320-.
- — — and vision of distant objects. *Meidinger, H.* Karlsruhe Nt. Vr. Vh. 11 (1891) (Ab.) 360-.

## 3260 Energy of Sun-light.

(See also Astronomy 4200; Meteorology 0930.)

- Actinometric measurements of solar heat on Alps. *Rizzo, G. B.* Spet. It. Mm. 26 (1898) 79-; N. Cim. 7 (1898) 120-; Spet. It. Mm. 27 (1899) 10-.
- — — — — Mt. Whitney. *Langley, S. P.* U. S. Sig. Serv. Pp. No. 15 (1884) 242 pp.
- observations, accuracy obtainable in. *Saveljev, R. N.* Rs. Ps.-C. S. J. 25 (Ps.) (1893) 1-; A. C. 28 (1893) 394-; 29 (1893) 260-.
- — — — — (Saveljev). *Wild, H.* A. C. 29 (1893) 283-.
- — — — — (—). *Chvolson, O.* A. C. 30 (1893) 141-.
- — — — —. *Saveljev, R. N.* A. C. 4 (1895) 424-.
- — — on Mt. Blanc, 1887. *Vallot, J.* Mt. Blanc Obs. A. 2 (1896) 77-.
- — — — — during partial solar eclipses. *Vallot, J., & Vallot, (Mme.) G.* Mt. Blanc Obs. A. 2 (1896) 71-.
- Actinometry. *Radau, R.* Mon. Sc. 19 (1877) 524-, 563-.
- *Frölich, O.* [1883-87] Elekttech. Z. 5 (1884) 3-; A. Ps. C. 21 (1884) 1-; Wien Met. Z. 19 (1884) 209-; Met. Z. 1 (1884) 247-; A. Ps. C. 30 (1887) 582-.

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- Actinometry, chemical, at different heights and temperatures. *Vallot, J., & Vallot, (Mme.) G.* Mt. Blanc Obs. A. 3 (1898) 81-.
- , Langley's measurement. *Maurer, J. Z.* Instk. 6 (1886) 237-.
- , slow, process. *Downes, A.* C. N. 42 (1880) 178.
- , use of ice calorimeter. *Michelson, V. A.* Rs. Ps.-C. S. J. 26 (Ps.) (1894) 1-; J. de Ps. 4 (1895) 578-.
- Atmospheric pressure, influence on chemical action of direct sunlight. *Andresen, M.* Mt. Blanc Obs. A. 4 (1900) 1-.
- Solar energy, conservation. *Siemens, (Sir) C. W.* Franklin I. J. 84 (1882) 57-.
- — — — — (Siemens). *Archibald, E. D.* Nt. 25 (1882) 504.
- — — — — (Archibald, Morris, Hunt and Fitz Gerald). *Siemens, (Sir) C. W.* Nt. 25 (1882) 504-, 603; 26 (1882) 80.
- — — — — (Siemens). *Morris, C.* Nt. 25 (1882) 601-.
- — — — — (—). *Hunt, T. S.* Nt. 25 (1882) 602-.
- — — — — (—). *FitzGerald, G. F.* Nt. 26 (1882) 80.
- — — — — (—). *Faye, H. A. É.* C. R. 95 (1882) 612-.
- — — — — (Faye). *Siemens, (Sir) C. W.* C. R. 95 (1882) 769-.
- — — — — (Siemens). *Hirn, G. A.* C. R. 95 (1882) 812-.
- — — — — (Hirn). *Siemens, (Sir) C. W.* C. R. 95 (1882) 1087-.
- — — — —. *Faye, H. A. É.* C. R. 95 (1882) 1110-.
- — — — — (Siemens). *Hirn, G. A.* C. R. 95 (1882) 1195-.
- — — — —. *Tommasi, D.* Les Mondes 3 (1882) 500-.
- — — — — (regenerative theory). *Cook, E. H.* Ph. Mg. 15 (1883) 400-.
- — — — — (Cook). *Siemens, (Sir) C. W.* Ph. Mg. 16 (1883) 62-.
- — — — — (Faye and Hirn). *Siemens, (Sir) C. W.* C. R. 96 (1883) 48-.
- physics, questions. *Siemens, (Sir) C. W.* [1883] R. I. P. 10 (1884) 315-.
- Sun, does Earth receive any direct heat from? *Howorth, H. H.* Manch. Lt. Ph. S. P. 13 (1874) 181-.
- Sun's temperature. *Le Chatelier, H.* C. R. 114 (1892) 737-, 864.

## VELOCITY, WAVE-LENGTH, ETC., OF RADIATION.

### 3400 General.

(See also 2990.)

- Displacements, continuous, of particles of medium, formulæ connected with. *Tait, P. G.* Edinb. R. S. P. 4 (1862) 617-.
- Fourier's double integrals, application to optical problems. *Godfrey, C.* [1899] Phil. Trans. (A) 195 (1901) 329-.
- Heat, light and colours. *Blackburne, W.* Tilloch Ph. Mg. 6 (1800) 334-.



- Heat, light and electricity, wave theories. *Hudson, H.* Ph. Mg. 44 (1872) 210-.
- and light, new theory. *Franklin, B.* [1788] Am. Ph. S. T. 3 (1793) 5-.
- — —, propagation, theory. *Cauchy, A. L.* C. R. 9 (1839) 233-.
- , light and sound compared. *Clausius, R.* Zür. Mschr. 2 (1857) 73-.
- and light, vibration theory. *Ampère, A. M.* A. C. 58 (1835) 432-.
- — — waves, action on movable bodies. *Puschl, K.* Wien SB. 15 (1855) 279-.
- , undulatory theory. *Forbes, J. D.* Ph. Mg. 8 (1836) 246-.
- , — —. *Babinet, J.* C. B. 7 (1838) 781-.
- , — —. *Powell, B.* B. A. Rp. (1840) (pt. 2) 14-.
- , — —. *Mann, F.* Schölmilch Z. 2 (1857) 280-; 3 (1858) 57-; (vi *Adds.*) Sch. Gs. Vh. 42 (1857) 157-.
- , — —. *Babinet, J.* C. R. 63 (1866) 581-, 662-.
- LIGHT.**
- action. *Kastner, K. W. G.* D. Nf. Vsm. B. (1842) 25-.
- apparently monochromatic, analysis by Newton's rings. *Carvallo, E.* C. R. 130 (1900) 496-.
- attraction and repulsion. *Recamier, —.* C. R. 31 (1850) 851-.
- and elasticity, theory. *Barré de Saint-Venant, —.* L'I. 24 (1856) 32-.
- etheral hypothesis. *Samuelson, J.* QJ. Sc. 6 (1869) 1-.
- mathematical development of laws. *Buquoy, G. von.* Oken Isis (1824) 728-.
- monochromatic, as damped vibrations. *Rovida, A.* Rv. Sc. [Ind.] 30 (1898) 225-.
- motion in transparent media. *La Place, P. S. (marquis) de.* [1806] Par. Mm. de l'I. (1809) 300-.
- propagation. *Müller, J. J.* [1871] A. Ps. C. 145 (1872) 86-.
- , *Gouy, A.* C. B. 91 (1890) 877-.
- , and chemical composition, relations between. *Schrauf, A.* Pogg. A. 118 (1863) 359-; 119 (1863) 461-, 553-.
- , — density and composition of the medium, relation between. *Lorentz, H. A.* Amst. Ak. Vh. 18 (1879) 112 pp.; A. Ps. C. 9 (1880) 641-.
- , dependence on density. *Schrauf, A.* Pogg. A. 116 (1862) 192-.
- in isophanous media. *Cauchy, A. L.* C. R. 30 (1850) 33-.
- isotropic media. *Rubenson, R.* Stockh. Öfv. (1884) No. 10, 3-; Fsch. Ps. (1885) (Ab. 2) 7-.
- , lateral, or parageny. *Babinet, J.* Cosmos 25 (1864) 393-, 421-.
- , law. *Poynting, J. H., & Love, E. F. J.* [1888-88] Birm. Ph. S. P. 5 (1885-87) 354-; 6 (1887-89) 168.
- in media at rest and in motion, new theory. *Sagnac, G.* C. R. 129 (1899) 756-, 818-; Par. S. Ps. Sé. (1899) 162-.
- propagation in water and transparent bodies. *Maistre, X. de.* Bb. Un. 57 (1834) 200-.
- property of repulsive forces acting upon. *Malus, É. L.* Arcueil Mm. Ps. 2 (1809) 254-.
- radiation, theory. *Kirchhoff, G.* Berl. Ak. Sb. (1882) 641-.
- recent views. *Witkowski, A.* Kosmos (Lw.) 12 (1887) 71-.
- solar, mechanical energy of cubic mile; and possible density of luminiferous medium. *Thomson, (Sir) W.* [1854] C. R. 39 (1854) 529-; Edinb. R. S. T. 21 (1857) 57-.
- , number of primitive calorific rays. *Young, M.* [1798] Ir. Ac. T. 7 (1800) 119-.
- 2 theories, new critical point of conflict. *Breton, P.* [1872] (xxi) Isère S. Bll. 4 (1875) 236-, 237-.
- unpolarised, instrument for exhibiting mode of vibration. *Snell, E. S.* Am. As. P. (1850) 277-.
- velocity and aberration, historical note. *Liagre, J.* Brux. Ac. Bll. 13 (1862) 10-.
- , regarded as velocity of matter. *Preston, S. T.* Elect. 27 (1891) 576-.
- , and size of molecules of medium, relation between. *Joubin, P.* C. R. 115 (1892) 1061-, 1346.
- vibrations of common light. *Tait, P. G.* Edinb. R. S. P. 11 (1882) 418-.
- , law observed in. *Biot, J. B.* Arcueil Mm. Ps. 3 (1817) 132-.
- , regularity. *Gouy, —.* C. R. 120 (1895) 915-.
- wave propagation, anomalous. *Zeeman, P.* Ps. Z. 1 (1900) 542-.
- surface. *Cellérier, C.* (vii) Gen. S. Ps. Mm. 23 (1874) 161-.
- theory, kinematic equivalence. *Croullebois, M.* C. B. 93 (1881) 53-.
- wave-length, supposed dependence on intensity. *Lippich, F.* [1875] Wien Ak. Sb. 72 (1876) (Ab. 2) 355-.
- of different wave-lengths, velocity in vacuo. *Décombe, L.* C. R. 128 (1899) 172-.
- waves, attraction, proofs of phenomenon discovered by Guthrie and Schellbach. *Nieuwenhuijzen Kruseman, J.* Utr. Prv. Gn. Aant. (1875) 36-.
- , 3 kinds, corresponding to simple movements of the ether. *Cauchy, A. L.* C. B. 27 (1848) 621-.
- , motion, Wheatstone's apparatus to illustrate. *Secchi, A.* Rm. Cor. Sc. 2 (1853) 183-.
- , passage through focus. *Joubin, P.* C. B. 115 (1892) 932-.
- , spherical and cylindrical. *Julius, V. A.* Arch. Néerl. 28 (1895) 226-.
- white, form of vibrations in. *Carvallo, E.* C. B. 130 (1900) 79-, 130-; J. de Ps. 9 (1900) 138-.
- , — — —. *Gouy, —.* C. R. 130 (1900) 241-.
- , — — —. *Carvallo, E.* C. B. 130 (1900) 401-.
- , — — —; Fourier's series. *Gouy, —.* C. B. 130 (1900) 560-.

## 3405 Radiation-Pressure      Velocity of Light, Measurements 3410

- white, measurement of large path differences. *Joubin, P.* C. R. 116 (1893) 638-.
- , —, —, — (Joubin). *Cornu, A. C. R.* 116 (1893) 711.
- , —, —, —. *Joubin, P.* C. R. 116 (1893) 872.
- Optics, part of a course. *Duhem, P.* Brux. S. Sc. A. 18 (1894) (Pt. 2) 95-; 19 (1895) (Pt. 2) 27-; 20 (1896) (Pt. 2) 27-.
- Prismatic spectrum, prolongation. *Osann, G. W.* Würzb. Nw. Z. 5 (1864) 121-.
- Radiations, solar, why most refrangible do not produce light. *Kessler, G.* Arch. f. Oph. 1 (1854) 466-.
- Rotating bodies, optical phenomena. *Kurz, A.* A. Ps. C. (Ergänz.) 5 (1871) 653-.
- Transparency of the ether. *Brace, De W. B.* [1888] Nebr. Un. Stud. 1 (1888-92) 1-.
- Vibration, influence of motion of source on intensity of vibrations emitted. *Mees, R. A.* Amst. Ak. Vs. M. 9 (1876) 243-; Arch. Néerl. 12 (1877) 1-.
- intensity of wavelets diverging from every point of plane wave. *Smith, Arch.* [Signed H. T.] Camb. Mth. J. 3 (1841) 46-.
- Vibrations of the ether in media isophanous with reference to given direction. *Cauchy, A. L.* C. R. 30 (1850) 93-.
- — — — medium or system of 2 media. *Cauchy, A. L.* C. R. 7 (1838) 751-.
- Vibratory movements of system of molecules, perturbations produced by another system. *Cauchy, A. L.* C. R. 30 (1850) 17-.
- Wave motion. *Breton, Ph.* Les Mondes 18 (1868) 341-.
- propagation (theorem of Gergonne). *Léviatal, A. J.* de Ps. 2 (1873) 207-.
- in elastic medium. *Smith, Arch.* [Signed A. S.] Camb. Mth. J. 1 (1839) 97-.
- , Fresnel's laws, deduction from mechanical theory. *Haughton, S.* Ir. Ac. P. 4 (1850) 455-.
- , new theorem. *Stoney, G. J.* Ph. Mg. 43 (1897) 273-.
- Waves, experiments. *Weber, E. H., & Weber, W.* Kastner Arch. Ntl. 7 (1826) 45-.
- , plane, in elastic media. *Haughton, S.* [1849] Ir. Ac. T. 22 (1855) 97-.
- , —, 2 kinds in isotropic system of material points. *Cauchy, A. L.* C. R. 10 (1840) 905-.
- , —, propagation in system of molecules. *Cauchy, A. L.* C. R. 7 (1838) 865-.
- Mechanical equivalent of light. *Géraldy, F.* Lum. Élect. 6 (\*1882) 18-.
- — — — (Thomsen's experiments). *Tumirs, O.* Wien Ak. Sb. 97 (1889) (Ab. 2a) 1627-; 98 (1890) (Ab. 2a) 826-, 1121-.
- — — —. *Ravenshear, A. F.* Elect. Rv. 36 (1895) 470.
- Radiation pressure of light. *Lebedev, P.* Laus. S. Vd. Bll. 35 (1899) xxxv.
- — — —. *Goldhammer, D.* [1900] Kazan S. Ps.-Mth. Bll. 10 (1901) 231-; Arch. Néerl. 5 (1900) 467-.
- — — —, Maxwell-Bartoli's. *Lebedev, P.* Rs. Ps.-C. S. J. 32 (Ps.) (1900) 211-; Sc. Abs. 4 (1901) 465.
- —, and motion of the ether. *Lodge, O.* Ph. Mg. 46 (1898) 414-.
- —, showing apparent failure of electromagnetic equations. *Rayleigh, (Lord).* Ph. Mg. 45 (1898) 522-.

## 3410 Velocity of Light, Measurements of.

- Arago, D. F. J.* [1810] C. R. 36 (1853) 38-.
- Parrot, G. F.* Gilbert A. 51 (1815) 292-.
- Fechner, G. T.* Kastner Arch. Ntl. 12 (1827) 22-.
- Astronomicus [Pseud.].* Madras J. 2 (1835) 290-.
- (Revolving mirror method.) *Arago, D. F. J.* C. R. 7 (1838) 954-.
- Richter, E.* Anhalt Vh. Nt. Vr. 1 (1840-42) 18-.
- Fizeau, H. L.* C. R. 29 (1849) 90-.
- (Revolving mirror method.) *Arago, D. F. J.* C. R. 30 (1850) 489-.
- Bourdat, —.* Grenoble Ac. Delph. Bll. 3 (1850) 45-.
- (Revolving mirror method.) *Foucault, L. C.* B. 30 (1850) 551-.
- (— — —) *Breguet, L., & Fizeau, H.* C. R. 30 (1850) 562-, 771-.
- Lechat, —.* (viii) Reims Sé. Ac. 12 (1850) 182-.
- Scarpellini, C.* Rm. Cor. So. 2 (1853) 126-.
- (Revolving mirror method.) *Foucault, L. A.* C. 41 (1854) 129-.
- Frič, A.* Živa (1859) 56-.
- (Revolving mirror method.) *Foucault, L. C.* B. 55 (1862) 501-, 792-.
- (— — —, Foucault's.) *Emery, L.* [1863] Laus. Bll. S. Vd. 7 (1864) 389-.
- (— — —, —.) *Moberg, A.* [1863] (viii) Helsingf. Öfv. 6 (1864) 2-.
- Pick, H.* [1863] (viii) Wien Schr. 3 (1864) 449-.
- Delaunay, C. E.* Smiths. Rp. (1864) 135-.
- Cornu, A.* C. R. 73 (1871) 857-.
- Laborde, —.* Les Mondes 29 (1872) 363-.
- (Toothed-wheel method.) *Cornu, A. C. R.* 76 (1873) 338-.
- Burgue, —.* C. R. 78 (1874) 1115.
- Cornu, A.* C. R. 79 (1874) 1861-; Par. Ec. Pol. J. cah. 44 (1874) 133-; Par. Obs. A. 13 (1876) A. 1-.

## 3405 Radiation-pressure. Mechanical Equivalent of Light.

(See 4210, 4215.)

- Mechanical equivalent of light. *Thomsen, J.* [1863] (viii) A. Ps. C. 125 (1865) 348-; Sk. Nf. F. 9 (1865) 341-.
- — — —. *Farmer, M. G.* [1865] Am. J. Sc. 41 (1866) 214.

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- (Error in Cornu's determination.) *Helmert, F.* R. As. Nr. 87 (1876) 123-.
- Michelson, A. A.* Nt. 18 (1878) 195; Am. As. P. (1878) 71-; (1879) 124-.
- Cornu, A.* C. R. 91 (1880) 1019-.
- (Cornu.) *Gouy, A.* C. B. 92 (1881) 84-.
- Cornu, A.* C. B. 92 (1881) 58-.
- Rayleigh, (Lord).* Nt. 24 (1881) 382-; 25 (1882) 52.
- Gouy, A.* C. B. 94 (1882) 1296-.
- Michelson, A. A.* Wash. As. Pp. for Ephem. & Naut. Alm. 1 (\*1882) 109-.
- (Revolving mirror method, Foucault's, improvements in apparatus.) *Wolf, C.* C. B. 100 (1885) 308-.
- (— — —, —, theory.) *Gouy, —.* C. B. 101 (1885) 502-.
- (— — —, —.) *Schuster, A.* Nt. 33 (1886) 439-.
- (— — —, —.) *Gibbs, J. W.* Nt. 33 (1886) 582.
- Gouy, —.* A. C. 16 (1889) 262-.
- Jaumann, G.* Wien Ak. Sb. 100 (1891) (Ab. 2a) 1289-.
- (1880-82.) *Newcomb, S.* Wash. As. Pp. for Ephem. & Naut. Alm. 2 (1891) 107-.
- Ristenpart, —.* [1894] Karlsruhe Nt. Vr. Vh. 11 (1896) (Sb.) 265-.
- Kaiser, —.* Nass. Vr. Jb. 51 (1898) xxxii.
- Cornu, A.* [1900] Sc. Abs. 4 (1901) 360-.
- Ferrotin, —.* C. R. 131 (1900) 731-.
- Finite velocity, Roemer's discovery. *Wernicke, A.* Z. Mth. Ps. 25 (1880) (H.-It. Ab.) 1-.
- Historical note. *Eriar, W.* Pogg. A. 88 (1853) 538-.
- — —. *Newcomb, S.* Nt. 34 (1886) 29-.
- Velocity in air and water. *Breguet, L., & Fizeau, H.* C. B. 30 (1850) 562-, 771-.
- — — —. *Foucault, L.* A. C. 41 (1854) 129-.
- — — carbon disulphide. *Gouy, —.* C. R. 103 (1886) 244-.
- — — —, of red and blue light. *Michelson, A. A.* B. A. Rp. (1884) 654.
- — — crystals. *Kohlrausch, W. F.* [1878-79] A. Ps. C. 6 (1879) 86-; 7 (1879) 427-.
- — — elements, and their crystalline form. *Zenger, C. W.* C. R. 75 (1872) 670-.
- — — glass, effects of heat. *Fizeau, H. L.* C. R. 54 (1862) 1237-; A. C. 66 (1862) 429-.
- — — and Kirkwood's analogy. *Chase, P. E.* Am. Ph. S. P. 18 (1880) 425-.
- — — in magnetic field. *Morley, E. W., & Eddy, H. T.* Am. As. P. (1890) 81-.
- — — different media. *Abria, —.* Moigno Cosmos 17 (1860) 261-.
- — — metals. *Grönberg, T.* Riga Cor.-Bl. 33 (1890) 5-.
- — — quartz. *Lang, V. von.* [1869] Wien Ak. Sb. 60 (1870) (Ab. 2) 767-.
- — — plates. *Hallock, W.* A. Ps. C. 12 (1881) 147-.
- — — of radiant heat. *Wrede, F. J.* Pogg. A. 53 (1841) 602-.
- — — in rarefied gases during electric discharge. *Edser, E., & Starling, S. G.* B. A. Rp. (1895) 635-.

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- Velocity in salts. *Piotrowski, G.* (xii) Krk. Ak. (Mt.-Prz.) Pam. 1 (1874) 152-.
- from stellar observations. *Charlier, C. V. L.* Stockh. Öfv. (1889) 523-.
- of sun's calorific rays. *Anon.* (vi) 1210
- Tilloch Ph. Mg.* 19 (1804) 309-.
- in transparent media. *Tralles, J. G.* [1820] Berl. Ab. (1820-21) 133-.
- — — —. *Potter, R.* Ph. Mg. 3 (1833) 333-.
- — — water, change produced by heat. *Rühlmann, R.* A. Ps. C. 132 (1867) 1-, 177-.
- — — at various temperatures. *Jamin, J.* C. B. 43 (1856) 1191-.
- of white and coloured light. *Forbes, G., & Young, J.* [1881] Phil. Trans. 173 (1883) 231-.
- — — — — in air, water, and carbon disulphide. *Michelson, A. A.* Wash. As. Pp. for Ephem. & Naut. Alm. 2 (1891) 231-.
- Wave velocity in dielectrics. *Trouton, F. T.* Elect. 25 (1890) 556-.

### 3420 Aberration and Moving Media. Doppler's Principle.

(See also 6630; Astronomy 3310.)

#### ABERRATION.

- Fresnel, A. J.* A. C. 9 (1818) 57-, 286.
- Babinet, J.* C. R. 9 (1839) 774-.
- Stokes, G. G.* Ph. Mg. 27 (1845) 9-; 29 (1846) 62-.
- Challis, J.* Ph. Mg. 27 (1845) 321-.
- (Challis.) *Stokes, G. G.* Ph. Mg. 28 (1846) 15-, 335-.
- (Fresnel's theory.) *Stokes, G. G.* Ph. Mg. 28 (1846) 76-.
- (Stokes.) *Challis, J.* Ph. Mg. 28 (1846) 90-.
- Challis, J.* Ph. Mg. 28 (1846) 176-, 393-.
- Powell, B.* [1846-47] Ashmol. S. P. 2 (1843-52) 136-; Ph. Mg. 29 (1846) 425-; (vi) *Adds.* 30 (1847) 98-.
- Beer, A.* Pogg. A. 93 (1854) 213-.
- Challis, J.* Ph. Mg. 9 (1855) 430-.
- (Theory.) *Eisenlohr, F.* Heidel. Vh. Nt. Md. 3 (1865) 190-.
- Willigen, V. S. M. van der.* Harl. Arch. Ms. Teyl. 1 (1868) 364-.
- Besant, W. H.* QJ. Mth. 11 (1871) 38-.
- (Theory.) *Challis, J.* Ph. Mg. 43 (1872) 289-.
- Despeyroux, C.* Toul. Mm. Ac. 4 (1872) 232-.
- Schouten, G.* N. Arch. Wisk. 1 (\*1875) 199-.
- Mascart, —.* C. B. 118 (1891) 571-.
- Aberration as affected by Earth drawing the ether along with it. *Höfler, F.* Zür. Ps. Gs. Jbr. (1895) 15-.
- and astronomical refraction, theories. *Bonnet, O.* N. A. Mth. 6 (1887) 335-, 554-.
- — — constitution of luminiferous ether. *Stokes, G. G.* Ph. Mg. 29 (1846) 6-.

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- Aberration and Doppler's principle. *Gilbert*, P. Rv. Quest. Sc. 30 (1891) 225-, 558-.
- Cause. *Forstner*, — von. *Crelle* J. 20 (1840) 101-.
- , *Doppler*, C. *Böhm. Gs. Ab.* 3 (1843-44) 747-.
- , *Challis*, J. *Ph. Mg.* 3 (1852) 53-.
- Course of ray of light from a star to Earth. *Challis*, J. *Ph. Mg.* 32 (1848) 168-.
- Motion of bodies, influence on velocity of light in their interior. *Fizeau*, H. L. *C. R.* 33 (1851) 349-; *A. C.* 57 (1859) 385-.
- Earth, influence on diffraction. *Willigen*, V. S. M. van der. [1870] (xi) *Haarl. Ms. Teyl. Arch.* 3 (1874) 72-.
- , —, — light phenomena. *Fresnel*, A. J. *A. C.* 9 (1818) 57-, 286.
- , —, —, —. *Babinet*, J. *C. R.* 55 (1862) 561-.
- , —, —, —. *Lorentz*, H. A. *Amst. Ak. Vs. M.* 2 (1886) 297-; *Aroh. Néerl.* 21 (1887) 103-.
- , —, —, — propagation in doubly refracting media. *Lorentz*, H. A. *Amst. Ak. Vs.* [1] (1893) 149-; *Fschr. Ps.* (1893) (Ab. 2) 8-.
- the ether near Earth. *Lodge*, O. [1892-93] *R. I. P.* 13 (1893) 565-; *Phil. Trans.* (A) 184 (1894) 727-; *Ph. Mg.* 36 (1893) 549-.
- , influence on refraction. *Prevost*, P. *Gen. Mm. S. Ps.* 1 (1821) 25-.
- of light as affected by refracting and reflecting substances which are also in motion. *Robinson*, J. [1788] *Edinb. R. S. T.* 2 (1790) 83-.
- Motions, astronomical, influence on optical phenomena. *Ketteler*, E. *A. Ps. C.* 144 (1872) 109-, 287-, 363-, 550-; 146 (1872) 406-; 147 (1872) 404-, 478-; 148 (1873) 435-.
- Phenomena in case of telescope full of water. *Pellat*, H. *Par. S. Ps. S6.* (1895) 14-.
- Stokes's theory. *Lorentz*, H. A. *Amst. Ak. Vs.* [1] (1893) 97-.
- , —, on supposition of variable density of the ether. *Lorentz*, H. A. *Amst. Ak. Vs.* 7 (1899) 523-; *Amst. Ak. P.* 1 (1899) 443-.
- Undulatory theory of light, proof from aberration. *Riecke*, —. *Grunert Arch.* 18 (1852) 33-.

## DOPPLER'S PRINCIPLE.

- (Coloured light of double stars.) *Doppler*, C. *Böhm. Gs. Ab.* 2 (1841-42) 465-.
- (Deviation of rays of light and sound by rotation of medium of propagation.) *Doppler*, C. [1843] *Böhm. Gs. Ab.* 3 (1843-44) 417-.
- (Influence of motion of medium of propagation on ether-, air- or water-waves.) *Doppler*, C. *Böhm. Gs. Ab.* 5 (1847) 293-.
- (— — — on intensity of sounds.) *Doppler*, C. *Wien SB.* (1851) (Ab. 2) 162-.
- Lundquist*, G. *Ts. Mt. Fys.* 4 (1871) 160-.
- Mascart*, É. *Par. Éc. Norm. A.* 1 (1872) 157-.
- Bichat*, E. *Nancy S. Sc. Bll.* 4 (11<sup>e</sup> Ann.) (1878) 5-.

- Voigt*, W. *Gött. Nr.* (1887) 41-.
- Dufour*, C. *Arch. Sc. Ps. Nt.* 24 (1890) 242-.
- Application to luminous gas molecules. *Pfaundler*, L. [1877] *Wien Ak. Sb.* 76 (1878) (Ab. 2) 852-.
- , —, —. *Ebert*, H. [1889] *A. Ps. C.* 86 (1889) 466-; *Erlang. Ps. Md. S. Sb.* 21 (1890) 7-.
- radiation energy. *Guillaume*, C. É. *Par. S. Ps. S6.* (1894) 161-.
- Doppler's theory. *Hoorweg*, J. L. *Aroh. Néerl.* 9 (1874) 1-.
- (Hoorweg). *Rink*, H. J. (xii) *Mbl. Nt.* 4 (1874) 93-.
- (Rink). *Hoorweg*, J. L. (xii) *Mbl. Nt.* 4 (1874) 114-.
- , *Zenker*, W. *As. Nr.* 85 (1875) 151-.
- Doppler-Fizeau method. *Moessard*, —. *C. R.* 114 (1892) 1471-.
- , exact formula. *La Fresnaye*, H. de. *C. B.* 115 (1892) 1289-; 116 (1893) 75, 160.
- principle, experimental verification. *Bélopolsky*, A. *Spet. It. Mm.* 23 (1895) 122-.
- Motion of source of light, influence. *Fizeau*, H. L. [1848] *Par. S. Phlm. PV.* (1848) 81-; (vii) *A. C.* 19 (1870) 211-.
- , —, —, — on spectra. *Fizeau*, H. L. *C. R.* 69 (1869) 743; 70 (1870) 1062-.
- , —, —, —. *Heger*, R. *Dresden Sb. Isis* (1871) 162-.
- Refraction when prism and source of light are moving. *Willigen*, V. S. M. van der. *Amst. Vs. Ak.* 7 (1873) 257-; *Haarl. Arch. Ms. Teyl.* 3 (1874) 805-.
- Spectroscope, new application. *Secchi*, A. *Les Mondes* 16 (1868) 501-.

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- Double refraction of light in moving liquids. *Kundt*, A. *A. Ps. C.* 13 (1881) 110-.
- Drift, consequences of Fresnel's law. *Potier*, A. *J. de Ps.* 3 (1874) 201-.
- Ether, behaviour towards movement of Earth. *Des Coudres*, T. *A. Ps. C.* 38 (1889) 71-.
- , — in moving media. *Beer*, A. *Pogg. A.* 94 (1855) 428-.
- and Earth, relative motion. *Michelson*, A. A. *Am. J. Sc.* 22 (1881) 120-; *C. R.* 94 (1882) 520-.
- , —, —. *Michelson*, A. A., & *Morley*, E. W. *Am. J. Sc.* 34 (1887) 333-.
- , —, —. *Lorentz*, H. A. *Amst. Ak. Vs.* [1] (1893) 74-.
- , —, —. *Michelson*, A. A. *Am. J. Sc.* 3 (1897) 475-.
- , —, —: does the Earth carry the ether with it? *Lorentz*, H. A. *Amst. Ak. Vs.* 6 (1898) 266-; *Fschr. Ps.* (1897) (Ab. 2) 5-.
- , —, —, Michelson and Morley experiment. *Sutherland*, W. *Ph. Mg.* 45 (1898) 23-.
- , —, —, — (Sutherland). *Lodge*, O. *Ph. Mg.* 46 (1898) 348-.
- , —, —, — (Lodge). *Sutherland*, W. *Ph. Mg.* 47 (1899) 252-.
- , —, —, —, criticism. *Sutherland*, W. [1900] *Nt.* 63 (1900-01) 205-.

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- Ether, motion, and Earth's atmosphere. *Fitz Gerald, G. F.* Science 13 (1889) 890.
- , —, experiment. *Luvini, G.* Tor. Ac. Sc. At. 10 (1874-75) 517-.
- , —, —. *Mie, G.* D. Nf. Vh. (1900) (Th. 2, Hälfte 1) 28-.
- , —, and pressure of radiation. *Lodge, O.* Ph. Mg. 46 (1898) 414-.
- , permeability of matter for. *Zehnder, L.* A. Ps. C. 55 (1895) 65-.
- and ponderable bodies, relative motion. *Kelvin, (Lord).* [1900] R. I. P. 16 (1902) 363-.
- surrounding moving body, condition. *Franklin, W. S., & Nichols, E. L.* Ps. Rv. 1 (1894) 426-.
- Light in moving media, calculation. *Boussinesq, J.* C. R. 76 (1873) 1293-.
- , theory for moving media. *Voigt, W.* Gött. Nr. (1887) 177-.
- waves, action of moving matter on. *Potier, A.* J. de Ps. 5 (1876) 105-.
- , —, —, —. *Foussereau, G.* J. de Ps. 1 (1892) 144-; C. R. 120 (1895) 85-; Par. S. Ps. Sé. (1895) 26-.
- Propagation of light in moving media. *Veltmann, W.* As. Nr. 76 (1870) 129-; A. Ps. C. 150 (1873) 497-.
- , —, —, —. *Puschl, K.* Wien Sb. 68 (1873) (Ab. 2) 446-.
- , —, —, — and media at rest, new theory. *Sagnac, G.* C. R. 129 (1899) 756-, 818-; Par. S. Ps. Sé. (1899) 162-.
- Reflection of light, influence of rapid motion of mirror. *Fizeau, —.* C. R. 104 (1887) 935-.
- and refraction in moving media, limiting conditions. *Ketteler, E.* Berl. Ak. Mb. (1874) 82-.
- Refracting media, motion, influence on direction of luminous rays. *Respighi, L.* [1861] Bologna Mm. Ac. Sc. 2 (1862) 279-.
- Refraction, influence of motion. *Klinkerfues, W.* As. Nr. 65 (1865) 17-; Gött. Nr. (1865) 157-, 210, 376-; (1866) 33-; As. Nr. 66 (1866) 337-.
- Rotation of plane of polarisation of light by moving media. *Thomson, J. J.* Camb. Ph. S. P. 5 (1886) 250-.
- Velocity of light, influence of velocity of medium. *Michelson, A. A., & Morley, E. W.* Am. J. Sc. 31 (1886) 377-.
- , —, —, —, —, Michelson and Morley experiments. *Cornu, A.* C. R. 102 (1886) 1207-.
- , —, —, — in moving media. *Hoek, M.* Amst. Vs. Ak. 2 (1868) (Ntk.) 189-; Arch. Néerl. 3 (1868) 180-; Amst. Vs. Ak. 3 (1869) (Ntk.) 306-; Arch. Néerl. 4 (1869) 443-.
- , —, —, —. *Boussinesq, J.* C. R. 74 (1872) 1573-.
- , —, —, — near rapidly moving matter, experiment. *Lodge, O. J.* B. A. Rp. (1891) 560-.
- , —, —, — and the solar system. *Hüfner, F. D.* Nf. Vh. (1896) (Th. 2, Hälfte 1) 37-.

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#### 3430 Wave-Length of Rays in the Luminous Spectrum, Measurement of.

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- Stokes, G. G.* B. A. Rp. (1849) (pt. 2) 11.
- Ångström, A. J.* [1863] (vii) A. Ps. C. 123 (1864) 489-.
- Mascart, É.* C. R. 58 (1864) 1111-; Par. Éc. Norm. A. 4 (1867) 7-; A. C. 13 (1868) 186-.
- Leitch, W.* [1870] Edinb. R. S. P. 7 (1872) 179-.
- Fizeau, C.* [1880] Ciel et Terre 1 (\*1881) 265-.
- Gerland, E.* [1886] Kassel Vr. Nt. B. 34 & 35 (1889) lii-.
- Runolfsson, N.* N. Ts. Fs. K. 2 (1897) 114-.
- Gamut of light. *Chase, P. E.* Franklin I. J. 74 (1877) 148.
- Gamuts of light and sound. *Chase, P. E.* Am. Ph. S. P. 13 (1873) 149-.
- Scale of wave-numbers, advantage of referring lines in spectrum to. *Stoney, G. J.* B. A. Rp. 41 (1871) (Sect.) 42-.
- , —, —, catalogues of spectral rays arranged on. *Stoney, G. J.* B. A. Rp. 42 (1872) 53-.
- Solar rays, chemical action, measurement of vibrations in. *Hunt, R.* [1853] Pht. S. J. 1 (1854) 81-.
- , —, oscillation-frequencies, catalogue. *Stoney, G. J.* B. A. Rp. (1878) 37-.
- spectrum, constitution and origin of group B. *Thollon, L.* J. de Ps. 3 (1884) 421-.
- , —, fixed lines. *Gladstone, J. H.* B. A. Rp. (1858) (pt. 2) 17.
- , —, radiation, waves, ether. *Broca, A.* Rv. Sc. 6 (1896) 1-.
- , —, scale of Kirchhoff's. *Hartmann, J.* Berl. Ak. Sb. (1898) 742-.
- Spectral lines, reversible, and analogy between their laws of distribution and intensity and those of hydrogen. *Cornu, A.* J. de Ps. 5 (1886) 93-.
- Telluric lines, Ångström's group a. *Cornu, A.* Par. S. Ps. Sé. (1884) 41-.
- Vibration producing primitive colours. *Forster, T.* Silliman J. 10 (1826) 188.

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- absolute. *Bell, L.* Am. J. Sc. 33 (1887) 167-; B. A. Rp. (1887) 584-; Am. J. Sc. 35 (1888) 265-, 347-.
- of blue indium line. *Müller, Joh.* A. Ps. C. 124 (1865) 637-.
- , —, —. *Mendenhall, T. C.* Am. As. P. (1877) 125-.
- bright lines of spectrum. *Müller, Joh.* [1863] (viii) Freiburg B. 3 (1865) 29-.
- by comparison. *Gibbs, W.* Am. J. Sc. 45 (1868) 298-.

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- by diffraction and interference. *Veress, V.* (xii) Orv.-Term. Éts. 6 (1881) (*Term. Szak*) 215-.
- of electric radiation by grating. *Bose, J. C.* R. S. P. 60 (1897) 167-.
- enhanced lines, table. *Lockyer, (Sir) N.* R. S. P. 65 (1900) 452-.
- Fraunhofer lines. *Kirchhoff, G.* Berl. Mb. (1859) 662-; Erdm. J. Pr. C. 80 (1860) 480-.
- — —. *Ditscheiner, L.* Wien Sb. 50 (1865) (Ab. 2) 296-; 52 (1866) (Ab. 2) 289-; 63 (1871) (Ab. 2) 565-.
- — —. *Kuribaum, F.* A. Ps. C. 33 (1888) 159-, 381-.
- Fresnel's measurements. *Merczyng, H. A.* Ps. C. 22 (1884) 129-.
- by interference bands in grating spectrum. *Weinberg, M.* Exner Rpm. 19 (1883) 148-.
- interference method of measuring small changes. *Ebert, —.* D. Nf. Tbl. (1887) 82-.
- — —, spectral. *Macé de Lépinay, J.* J. de Ps. 4 (1885) 261-.
- of A line. *Mascart, —.* C. R. 56 (1863) 138-.
- D<sub>2</sub> line (absolute measurement). *Macé de Lépinay, J.* C. R. 102 (1866) 1153-; J. de Ps. 5 (1886) 411-; A. C. 10 (1887) 170-.
- D<sub>2</sub> (helium) line. *Palmer, A. De F. (jun.)* Am. J. Sc. 50 (1895) 357-.
- measurement by. *Macé de Lépinay, J.* C. R. 100 (1885) 1377-; J. de Ps. 5 (1886) 405-; A. C. 10 (1887) 68-; Par. S. Ps. Sé. (1898) 114-; A. C. 5 (1895) 210-.
- of, applied to metrology. *Michelson, A. A.* [1890-93] Am. J. Sc. 39 (1890) 115-; Nt. 49 (1893-94) 56-.
- — cube in terms of. *Fabry, C., Macé de Lépinay, J., & Perot, A.* C. R. 128 (1899) 1817-.
- for spectroscopy. *Perot, A., & Fabry, C.* C. R. 130 (1900) 492-.
- of mercury radiations. *Fabry, C., & Perot, A.* C. R. 126 (1898) 1706-.
- method, new. *Stefan, J.* Wien Sb. 53 (1866) (Ab. 2) 521-.
- and metre, progress of experiments for comparing. *Peirce, C. S.* Am. J. Sc. 18 (1877) 51.
- and oscillation-frequencies of coloured rays. *Drobisch, M. W.* Leip. B. (1852) 57-.
- of principal lines in spectrum of gallium. *Hartley, W. N., & Ramage, H.* [1898] *Dubl. S. Sc. T.* 7 (1902) 1-.
- by prismatic scale. *Herschel, A. S.* [1873] *Newcastle C. S. T.* 2 (1871-74) 131-.
- radiations of nearly equal wave-lengths, separation. *Hamy, M.* C. R. 125 (1897) 1092-.
- of red lines in spectrum of potassium. *Deslandres, H.* C. R. 106 (1888) 739.
- reduction of Kirchhoff's results to. *Hasselberg, B.* [1878] *St. Pét. Ac. Sc. Bll.* 25 (1879) 131-.
- by refractive indices. *Gibbs, W.* Am. J. Sc. 50 (1870) 45-.
- of sodium as standard of length, interference method. *Michelson, A. A., & Morley, E. W.* Am. J. Sc. 34 (1887) 427-.
- solar lines observed by Kirchhoff, computation. *Airy, (Sir) G. B.* [1867-71] *Phil. Trans.* 158 (1868) 29-; 162 (1872) 89-.
- of solar spectrum. *Bernard, F.* C. R. 59 (1864) 32.
- — —. *Willigen, V. S. M. van der.* Arch. Néerl. 2 (1867) 115-; *Harl. Arch. Ms. Teyl.* 1 (1868) 1-, 57-, 280-.
- — —, interference method. *Bernard, F.* C. R. 58 (1864) 1153-.
- — —, — — —. *Perot, A., & Fabry, C.* C. R. 131 (1900) 700-.
- — —, relative. *Rowland, H. A.* Ph. Mg. 23 (1887) 257-.
- spectrometric measurement. *Egyed, M.* (xii) *Kolozsvár Orv.-Term. Társ. Éts.* [3] (1879) (*Term. Szak*) 1-.
- as standard of length. *Govi, G.* [1871] *Tor. At. Ac. Sc.* 7 (1871-72) 115-.
- — —. *Michelson, A. A., & Morley, E. W.* Am. J. Sc. 38 (1889) 181-.
- standard metre in terms of. *Michelson, A. A.* C. R. 116 (1893) 790-; *Par. Poids et Mes. Tr. Mm.* 11 (1895) 237 pp.
- metres. *Benoit, J. R., & Guillaume, C. É.* *Par. Poids et Mes. Tr. Mm.* 11 (1895) 16 + lxxxiii pp., 31 + lvi pp.
- , table. *Rowland, H. A.* J. H. Un. Cir. 8 (1888-89) 69, 78.
- tables. *Brit. Ass. Comm. B. A. Rp.* (1884) 351-; (1885) 288-; (1886) 167-; (1890) 224-; (1891) 161-; (1892) 193-; (1893) 387-; (1894) 248-; (1895) 273-; (1896) 273-; (1897) 75-; (1898) 313-; (1899) 257-; (with index) (1900) 193-.
- by Talbot's bands. *Macé de Lépinay, —.* C. R. 100 (1885) 1377-.

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- Fizeau, H. L.* Par. S. Phlm. PV. (1847) 108-.
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### 3630 Spectra formed by Diffraction and by Gratings.

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- Light reflected from sea-waves. *Spooner, J.* Zsch. Cor. 6 (1822) 331-; 7 (1822) 65-, 140-.
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- — by solutions. *Spring, W.* Brux. Ac. Bll. (1899) 300-.
- — in translucent bodies. *Chvolson, O.* [1886-89] St. Pét. Ac. Sc. Bll. 31 (1887) 213-; 33 (1890) 221-.
- sky-light in water. *Meidinger, —*. [1890] Karlsruhe Nt. Vr. Vh. 11 (1896) (Sb.) 82-.
- Divisions on glass, method of making bright on a dark ground. *Martens, F. F.* Z. Instk. 17 (1897) 298-; 18 (1898) 32.
- Electric light in fog. *Keller, H.* Humb. 3 (1884) 134-.
- Illumination of liquids. *Lallemant, A.* C. R. 69 (1869) 282-.
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- Incombustibility of spider-threads in focus of burning-glass. *Mohr, C. F.* Z. Mth. Pa. 16 (1871) 513-.
- Light and heat, modification on passing through glass. *Coathupe, C. T.* Ph. Mg. 16 (1840) 437-.
- , loss by glass shades. *Storer, F. H.* Silliman J. 30 (1860) 420-.
- , — — — — *King, W.* Silliman J. 31 (1861) 283-.
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- Opacity of carbon. *Dufour, C.* Laus. S. Vd. Bll. 31 (1895) 139-.
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- Opalescence of ancient glass, etc. *Bellani, A.* Mil. G. S. Inc. 5 (1809) 127-.
- Optical notes. *Dove, H. W.* Pogg. A. 110 (1860) 286-.
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- for indigo and bloodstone. *Willigen, V. S. M. van der.* Amst. Vs. Ak. 13 (1862) 43-; Pogg. A. 117 (1862) 464-.
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- — — — —, Rood's demonstration. *Mayer, A. M.* Science 3 (1896) 705-.
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- — — glass of antimony. *Potter, R.* B. A. Rp. (1833) 377-; Ph. Mg. 4 (1834) 6-.
- — — Iceland spar, in different planes. *Potter, R.* L'I. 3 (1835) 326.
- Transmission of light through turbid media. *Hurion, A.* C. R. 112 (1891) 1431-.
- — solar radiation through air charged with dust from Etna. *Bartoli, A.* Catania Ac. Gioen. At. 7 (1894) Mem. 15, 6 pp.

### Theory of Dispersion 3820

### 3820 Dynamical Theory of Reflection and Refraction in Transparent Media. Polarisation by Reflection.

(See also 4010.)

- Aberration, longitudinal, of prisms. *Abbot, C. G., & Fowle, F. E. (jun.)* Am. J. Sc. 2 (1896) 255-.
- Bounding surfaces of bodies, conditions relating to. *Cauchy, A. L.* C. R. 10 (1840) 266-.

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- *Lang, V. von.* *Wien Ak. Sb.* 73 (1876) (*Ab. 2*) 666-.
- *Ketteler, E.* [1878] *Bonn NH. Vr. Vh.* 36 (1879) 1-.
- *Lommel, E. C. J.* *Erlang. Ps. Md. S. Sb.* 10 (1878) 98-.
- *Goldhammer, G.* *Rs. Ps.-C. S. J.* 17 (*Ps.*) (1885) 331-.
- *Koláček, F.* *A. Ps. C.* 47 (1892) 258-.
- *Ketteler, E.* *A. Ps. C.* 49 (1893) 509-.
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- , Lommel's. *Voigt, W.* *A. Ps. C.* 17 (1882) 468-.

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- theory, MacCullagh's. *Basset, A. B.* Nt. 52 (1895) 595.
- , —. *Larmor, J.* [1895] Nt. 53 (1895-96) 5.
- , —. *Basset, A. B.* [1895] Nt. 53 (1895-96) 55.
- , mathematical. *Senarmont, H. de.* Liouv. J. Mth. 8 (1843) 361-.
- , wave surface in. *Lubbock, J. W.* Ph. Mg. 11 (1837) 417-; 12 (1838) 47-; 15 (1839) 351-.
- variations with temperature. *Rudberg, F.* Ph. Mg. 1 (1832) 409-; *Pogg. A.* 26 (1832) 291-.
- wood, for electromagnetic waves. *Mazzotto, D.* Rm. B. Ac. Linc. Rd. 6 (1897) (Sem. 2) 73-.
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- Doubly refracting crystals, effect of pressure. *Brewster, (Sir) D.* [1816] Edinb. R. S. T. 8 (1818) 281-.
- , —, —, —. *Pfaff, F.* Pogg. A. 107 (1859) 333-; 108 (1859) 598-.
- , —, formula for determining optical constants. *Stokes, G. G.* Camb. and Dubl. Mth. J. 1 (1846) 183-.
- , —, isogyric surface, general theory. *Lommel, E. C. J.* Erlang. Ps. Md. S. Sb. 14 (1882) 97-.
- , —, path of rays in. *Gruzintsev, A. P.* (XII) Kharkov Mth. S. Com. (1879) 82-.
- , —, principal plane, determination. *Abria, O.* Bordeaux Mm. S. Sc. 9 (1873) 499-.
- , —, media, Fermat's law. *Pitsch, H.* Wien Ak. Sb. 89 (1884) (Ab. 2) 459-.
- , —, metallic and total reflection in. *Ketteler, E.* A. Ps. C. 22 (1884) 204-.
- , —, movement of light in, laws. *Hollefreund, K.* [1883] Ac. Nt. C. N. Acta 46 (\*1884) 1-.
- , —, prisms, minimum deviation. *Lang, V.* von. Wien SB. 33 (1858) 155-.
- , —, temperature effects and chromatic deviations. *Wellmann, V.* Berl. Strnw. Beob.-Ergebn. No. 6 (1892) 75-.
- , —, rhombs, compound, properties. *Potter, R.* (vi Add.) Ph. Mg. 16 (1858) 419-.
- Elastic bodies and light: circular vibrations in crystals. *Glan, P.* A. Ps. C. 60 (1897) 563-; 63 (1897) 230-.
- , —, —: quaternion investigations on crystals. *Glan, P.* A. Ps. C. 60 (1897) 174-; Berl. Ps. Gs. Vh. (1897) 106-, 129-; (1898) 8.
- Ether-motion in crystals. *Neumann, C.* [1868] Mth. A. 1 (1869) 325-; 2 (1870) 182-.
- Extraordinary refraction, law. *La Place, P. S. (marquis) de.* J. de Ps. 68 (1809) 107-.
- Felspar, properties. *Hoffmann, W.* Humb. 3 (1884) 409-.
- Fresnel-Huygens principle, consequences. *Exner, K.* Wien Ak. Sb. 98 (1890) (Ab. 2a) 51-.
- Fringes, 3 systems, normal production. *Croulebois, M.* C. R. 92 (1881) 1008-.
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- Gums, pseudo-crystalline properties. *Ebner, V. von.* Wien Ak. Sb. 98 (1890) (Ab. 2a) 1280-.
- Gypsum and quartz, action on light. *Biot, J. B.* Par. S. Phlm. Bll. (1815) 149-.
- Huygens's experiment, demonstration with lantern. *McNair, F. W.* Nt. 53 (1895-96) 535.
- Ice, optical behaviour when slowly melting. *Schmid, E. E.* Pogg. A. 55 (1842) 472-.
- , —, properties. *Bertin, A.* A. C. 69 (1863) 87-; 1 (1864) 240-; Strasb. Mm. S. Sc. 6 (1866-70) (livr. 1) [No. 4] 37-.
- , —, structure. *Brewster, (Sir) D.* QJ. Sc. 4 (1818) 155.
- , —, —. *Bertin, A.* A. C. 13 (1878) 283-.

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- and beryl with cavities containing fluid, properties. *Brewster, (Sir) D.* Ph. Mg. 33 (1848) 489-.
- , —, prisms, cut with one surface at right angles to optic axis, properties. *Salm-Horstmar, W. F.* Pogg. A. 86 (1852) 145-.
- , —, and quartz and arragonite prisms, properties. *Salm-Horstmar, W. F.* Pogg. A. 88 (1853) 591-.
- coloured border of secondary images. *Pfaff, C. H.* Schweigger J. 6 (1812) 177-.
- diachelical curves and parahelia in. *Plücker, J.* Bonn SB. Niedr. Gs. (1865) 10-.
- doubly refracted rays, azimuth difference. *Schrauf, A.* Z. Kr. 11 (1886) 6-, 674.
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- , —, in some specimens. *Münchow, K. D.* von. Gilbert A. 44 (1813) 24-.
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- multiple refraction. *Schöbl, E.* Wien SB. 8 (1852) 543-.
- oblique refraction. *Wollaston, W. H.* Phil. Trans. (1802) 381-.
- ordinary refraction. *Brewster, (Sir) D.* B. A. Rp. (1843) (pt. 2) 7-.
- , —. *Swan, W.* [1847] Edinb. R. S. T. 16 (1849) 375-.
- refracted paths in, demonstration. *Forster, (Prof.) A.* Bern Mt. (1870) 1v-.
- rings in fibrous specimens. *Stoney, G. J.* Ir. Ac. T. 24 (1860) (pt. 1) 31-.
- , —, produced by fine canals. *Schmidt, K. E. F.* A. Ps. C. 33 (1888) 534-.
- , —, in some specimens. *Brewster, (Sir) D.* B. A. Rp. (1844) (pt. 2) 9.
- and rock-salt, effect of pressure. *Reusch, E.* [1867] Edinb. R. S. P. 6 (1869) 134-.
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- , —, —, in crystal with rotatory power. *Brunhes, B.* Arch. Néerl. 5 (1900) 1-.



- Iridescent crystals (twin strata). *Rayleigh, (Lord)*. B. I. P. 12 (1889) 447-.
- Isomorphous mixed crystals, properties. *Ambronn, H., & Le Blanc, M.* Leip. Mth. Ps. B. 46 (1894) 173-; Z. Ps. C. 22 (1897) 121-.
- Kinetic theory of crystals. *Beckenkamp, J.* Würzb. Ps. Md. Sb. (1898) 29-.
- Light propagation in crystals. *Hamilton, (Sir)* W. R. B. A. Rp. (1838) (pt. 2) 6.
- — — — — *Green, G.* [1839] Camb. Ph. S. T. 7 (1842) 121-.
- — — — — *Broch, O. J.* Sk. Nf. F. 3 (1842) 233-; N. Mg. Ntvd. 5 (1848) 49-, 89-, 215-.
- — — — — *Briot, C.* C. R. 49 (1859) 888-.
- — — — — *Shebuev, G. N.* [1883] (xii) Kazan S. Nt. (Ps.-Mth.) P. 2 (1884) 1-.
- — — — — *Kovalevskij, S.* C. R. 98 (1884) 356-; Stockh. Ötv. (1884) No. 2, 119-.
- — — — — *Šebuev, G. N.* Kazan S. Nt. (Ps.-Mth.) P. 3 (1885) 5-.
- Lines seen through crystalline plate, foci. *Sorby, H. C.* [1877] R. S. P. 26 (1878) 384-.
- — — — — *Stokes, G. G.* [1877] R. S. P. 26 (1878) 386-.
- Liquid crystals. *Lehmann, O.* A. Ps. C. 40 (1890) 401-; A. Ps. 2 (1900) 649-.
- Liquids, crystalline. *Lehmann, O.* A. Ps. C. 41 (1890) 525-.
- Method for investigation of crystals. *Sorby, H. C.* Mn. Mg. 1 (1877) 193-.
- Optical anomalies. *Brauns, R.* Leip. Jablon. Preisschr. 29 (1891) 370 pp.
- — — — — cause. *Brauns, R.* Bonn NH. Vr. Vh. 44 (1887) 510-.
- — — — — of tesseral crystals. *Ben-Saude, A.* Portugal Trab. Gl. Com. 1 (\*1888-87) 15-.
- Organic silica is non-polarising. *Bailey, J. W.* J. Mcr. Sc. 4 (1856) 303-.
- Polarisation, effects of pressure in producing. *Brewster, (Sir) D.* Phil. Trans. (1815) 60-.
- — — — — phenomena due to crystallisation. *Biot, J. B.* C. R. 13 (1841) 155-.
- Polarised light, parallel, determination of properties. *Kjerulf, T.* Christiania F. (1885) No. 16, 4 pp.; Z. Kr. 15 (1889) 434.
- — — — — spectra by crystals in. *Deas, F.* [1870] Edinb. R. S. T. 26 (1872) 177-.
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- Proposition in physical optics, demonstration. *Anon.* (vi 279) Camb. Mth. J. 4 (1845) 115-.
- Quartz, biaxial properties under pressure. *Beaulard, F.* C. R. 112 (1891) 1503-.
- — — — — change of velocity of light in, by pressure. *Mach, E., & Merten, J.* [1875] Wien Ak. Sb. 72 (1876) (Ab. 2) 315-.
- — — — — laws. *MacCullagh, J.* Ir. Ac. P. 1 (1836-40) 385-.
- — — — — new method of testing plates as to position of optic axis. *Soleil, H.* C. R. 41 (1855) 669-.
- — — — — optical constants for green mercury light, application to measurement of thickness. *Macé de Lépinay, J.* J. de Ps. 9 (1900) 644-.
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- — — — — by selenitic systems. *Du Bois, H. E.* J. G. A. Ps. C. 46 (1892) 542-.
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- — — — — in arragonite and colourless topaz. *Rudberg, F.* Pogg. A. 17 (1829) 1-.
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- — — — — (verification of Soret's method). *Perrot, L.* C. R. 108 (1889) 137-.
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- — — — — ordinary and extraordinary, to extreme ultra-violet. *Sarasin, É.* C. R. 95 (1882) 680-.
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- — — — — difference between refractive indices for the 2 rays. *Macé de Lépinay, J.* C. B. 101 (1885) 874-.
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- rock forming minerals. *Zimányi, K.* Föl. Közl. 22 (1892) 382, 419-.
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- Tabasheer, properties. *Brewster, (Sir) D.* Phil. Trans. (1819) 283-.
- Testing crystals, etc. in polarised light. *Kohlmann, —.* (vi *Adds.*) Halle Jbr. NW. Vr. 4 (1851) 13-.
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- —, new optical properties deduced from geometric study. *Mannheim, A. J.* de Ps. 5 (1876) 137-.
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- — — pressure. *Brewster, (Sir) D.* Phil. Trans. (1816) 156-; (1890) 87-.
- — —. *Mach, E.* A. Ps. C. 146 (1873) 818-.
- — — in regular crystals. *Pockels, F. A.* Ps. C. 39 (1890) 440-.
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- , "toughened," properties. *Houwink, L.* Amst. Ak. Vh. (Sect. 1) 6 (1899) No. 2, 29 pp.
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*Jamin, J. A. C.* 19 (1847) 296-.

*Cauchy, A. L. C. R.* 26 (1848) 86-.

*Stokes, G. G. B. A. Rp.* (1850) (*pt. 2*) 19-.

*Mascart, É. C. R.* 76 (1873) 866-.

*Stokes, G. G. B. A. Rp.* (1876) (*Sect.*) 41-.

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*Conroy, (Sir) J. [1878] R. S. P.* 28 (1879) 242-.

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*Voigt, W. A. Ps. C.* 24 (1885) 495-.

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*Poincaré, H. C. R.* 112 (1891) 456-.

*Ketteler, E. A. Ps. C.* 67 (1899) 879-.

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— — — — —, — (Voigt). *Wüllner, A. A. Ps. C.* 23 (1884) 511-.

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— — — — — reflection at mercury. *Wallbott, H. A. Ps. C.* 68 (1899) 471-.

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Cobalt, optical constants. *Drude, P. A. Ps. C.* 42 (1891) 186-.

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*Brewster, (Sir) D. Phil. Trans.* (1830) 287-.

*Neumann, F. E. Pogg. A.* 26 (1832) 89-.

*Jamin, J. C. R.* 21 (1845) 490-.

*Powell, B. Phil. Trans.* (1845) 269-.

*Jamin, J. C. R.* 22 (1846) 477-; 23 (1846) 1103-.

*Quincke, G. A. Ps. C.* 128 (1866) 541-.

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- Total and metallic reflection of isotropic media. *Ketteler, E.* A. Ps. C. 22 (1884) 590-.
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- — medium, theory of light in. *Voigt, W.* A. Ps. C. 31 (1887) 233-.
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- — — —, — (Brewster). *Airy, G. B.* Ph. Mg. 30 (1847) 73-.
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- — — —, —, Brewster's. *Zambra, B.* Ven. At. (1858-59) 11-.
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- Talbot, W. H. F.* [1871] Edinb. R. S. P. 7 (1872) 408-.
- Tait, P. G.* [1871] Edinb. R. S. P. 7 (1872) 410-.
- Kundt, A.* A. Ps. C. 145 (1872) 67-, 164-.
- Meyer, O. E.* A. Ps. C. 145 (1872) 80-.
- Radau, R.* Mon. Sc. 18 (1876) 334-.
- Hurion, A.* Par. Éc. Norm. A. 6 (1877) 367-.
- Klercker, C. E. de.* [1879] Stockh. Ak. Hndl. Bh. 5 (1878-80) No. 20, 9 pp.; C. R. 89 (1879) 734-.
- Sieben, G.* A. Ps. C. 8 (1879) 137-.
- Ketteler, E.* A. Ps. C. 11 (1880) 210-.
- Kiessling, K. J.* [1883] Hamb. Mth. Gs. Mt. 1 (\*1889) 57, 59-.
- Klercker, C. E. de.* [1887] Stockh. Ak. Hndl. 22 (1886-90) No. 3, 35 pp.
- Bloch, S.* C. R. 116 (1893) 746-.
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- Petrusevskij, T.* Rs. Ps.-C. S. J. 28 (Ps.) (1896) 91-; Fschr. Ps. (1896) (Ab. 2) 33.
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- fast dyes, curves of some. *Pfüger, A.* *A. Ps. C.* 56 (1895) 412-.
- , test of Ketteler-Helmholtz theory. *Pfüger, A.* *A. Ps. C.* 65 (1898) 173-, 225-.
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- —. *Melde*, F. A. Ps. C. 126 (1865) 264-.
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- Camichel*, C. A. C. 5 (1895) 433-.
- Carvallo*, E. C. R. 120 (1895) 415-; A. C. 7 (1896) 58-.
- Agafonov*, V. C. R. 125 (1897) 87-.
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- , and lustre of their surfaces, connection. *Haidinger*, W. *Haidinger B.* 4 (1848) 427-; *Wien SB.* (1848) 84-.
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- and emission by glass and quartz at different temperatures. *Bouman*, Z. P. *Amst. Ak. Vs.* 5 (1897) 438-.
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- by epidote. *Ramsay*, W. Z. Kr. 13 (1888) 97-; 17 (1890) 645-.
- the ether, question. *Dolbear*, A. E. *Science* 21 (1893) 150-.
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- and radiation. *Herschel, (Sir) J. F. W.* Ph. Mg. 22 (1861) 377-.
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- and reflection of solar rays by coloured bodies. *Leedom, E. C.* Silliman J. 1 (1846) 28-.
- in ultra-violet. *Glatzel, B.* [1900] Ps. Z. 2 (1901) 173-.
- and refraction by opaque metals. *Wernicke, W.* Berl. Ak. Mb. (1874) 728-.
- , relation. *Ketteler, E. A.* Ps. C. 12 (1881) 481-.
- by sea-water. *Aitken, J. (of Darroch).* Edinb. R. S. P. 11 (1882) 637.
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- of specific rays, in reference to wave theory. *Brewster, (Sir) D.* Ph. Mg. 2 (1833) 360-.
- — — — (Brewster). *Airy, G. B.* Ph. Mg. 2 (1833) 419-.
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- alkaline chromates and chromic acid. *Sabatier, P.* Toul. Fac. Sc. A. 1 (1887) D, 11 pp.
- alkaloids. *Hartley, W. N.* Phil. Trans. 176 (1886) 471-.
- ammonia, methylamine, hydroxylamine, ald-oxime, and acetoxime. *Hartley, W. N., & Dobbie, J. J.* C. S. J. 77 (1900) (Pt. 1) 318-.
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- benzene. *Hartley, W. N., & Dobbie, J. J.* C. S. J. 73 (1898) (Pt. 2) 695-.
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- solutions. *Pitcher, F. B.* Am. J. Sc. 36 (1888) 332-.
- bolometric investigation. *Julius, W. H.* [1892] *Amst. Ak. Vh.* (Sect. 1) 1 (1893) No. 1, 49 pp.; *Fsohr. Ps.* (1892) (Ab. 2) 374-.
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- , morphine, strychnine, veratrine, santonin, in concentrated acids. *Meyer, A.* (xiii) *Arch. Phm.* 213 (1878) 413-.
- cell for. *Bostwick, A. E.* Am. J. Sc. 30 (1885) 452-.
- and chemical constitution of saline solutions, action of heat. *Hartley, W. N.* [1900] *Dubl. S. Sc. T.* 7 (1902) 253-.
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- — — —; — — (Chautard). *Pocklington, H.* [1873] (xi) *Phm. J.* 4 (1874) 61-.

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- Gladstone, J. H.* [1857] R. I. P. 2 (1854-58) 336-.
- Reynolds, J. E.* [1866] *Dubl. S. J.* 5 (1870) 89-.
- Landauer, J.* Berl. B. 11 (1878) 1772-; 14 (1881) 391-.
- Vogel, H. W.* Berl. Ak. Mb. (1878) 409-.
- MacMunn, C. A.* [1890] *Birm. Ph. S. P.* 2 (1881) 72-.
- Franklin, W. S.* [1884] *Kan. Ac. Sc. T.* 9 (1885) 98-.
- air. *Egorov, N. G.* Rs. Ps.-C. S. J. 17 (Ps.) (1885) 229; *Fsohr. Ps.* (1885) (Ab. 3) 272.
- (liquid). *Living, G. D., & Dewar, J. C.* R. 121 (1895) 162-; *Ph. Mg.* 40 (1895) 268-.

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- , variations in spectrum according to solvent. *Chautard, J. C. R.* 76 (1873) 1066-.
- chromates. *Sabatier, P. C. R.* 103 (1866) 49-.
- chromium compounds. *Lapraik, W. J. Pr. C.* 47 (1898) 305-.
- chromoxalates. *Magnanini, G., & Bentivoglio, T. Rm. R. Ac. Linc. Rd.* 2 (1893) (Sem. 2) 17-.
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- , *Reynolds, J. E., & Stoney, G. J. Ph. Mg.* 42 (1871) 41-; *B. A. Rp.* (1878) 434.
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- liquids. *Chautard, J. (xii) Brux. S. Sc. A.* 8 (1879) (Pt. 1) 126-.
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- substances and dyes. *Hartley, W. N. C. S. J.* 51 (1887) 152-.
- and colouring matter of beetroot. *Formánek, J. [1900] Prag České Ak. Fr. Jos. Rz. (Třída 2) 9* (1900) *Art.* 33, 4 pp.; *Prag Fr. Jos. Ac. Sc. Bll. (Mth. Nt.)* 6 (1901) 78-.
- colouring matters. *Girard, C., & Pabst, —. C. R.* 101 (1865) 157-.
- , change in spectra. *Vogel, H. W. Berl. B.* 11 (1878) 622-.
- , — — — in different solvents. *Lepel, F. von. Berl. B.* 11 (1878) 1146-.
- , organic. *Stöhr, A. Würzb. Nw. Z.* 6 (1866-67) 21-.
- , vegetable. *Palmer, T. M. Mcr. J.* 17 (1877) 225-.
- compounds in gaseous and liquid states. *Pauer, J. Erlang. Ps. Md. S. Sb.* 27 (1896) 120-.
- crystals, analysis of bands. *Becquerel, H. C. R.* 104 (1887) 165-.
- , birefringent. *Tutton, A. E. Nt.* 38 (1868) 343-.
- , variations in spectra. *Becquerel, H. A. C.* 14 (1868) 170-.
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- , *Crookes, W. Nt.* 34 (1866) 266.
- , *Bailey, G. H. B. A. Rp.* (1887) 654-.
- , *Thompson, C. M. C. N.* 55 (1887) 227.
- , *Bailey, G. H. B. A. Rp.* (1890) 773.
- salts. *Becquerel, H. C. R.* 104 (1887) 777-; 1691-; *A. C.* 14 (1898) 257-.
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- didymium and samarium, in ultra-violet. *Forsling, S. [1892] Stockh. Ak. Hndl. Bh.* 18 (1893) *No.* 10, 23 pp.; *Fschr. Ps.* (1893) (Ab. 2) 64.
- sulphate and neodymium-ammonium nitrate. *Dimmer, G. Wien Ak. Sb.* 106 (1897) (Ab. 2a) 1087-.
- dissolved cobaltous chloride. *Russell, W. J. C. S. P.* 1 (1885) 67-.
- effects produced by heat. *Rizzo, G. B. Tor. Ac. Sc. At.* 26 (1891) 632-.
- epidote. *Becquerel, H. C. R.* 108 (1889) 282-.
- erbium. *Bahr, J. F. A. C. Phm.* 135 (1865) 376.
- , holmium and thulium. *Forsling, S. [1898] Stockh. Ak. Hndl. Bh.* 24 (1899) *No.* 7, 35 pp.; *Fschr. Ps.* (1898) (Ab. 2) 58.
- nitrate. *Lecoq de Boisbaudran, P. E. C. R.* 88 (1879) 1187-.
- fluorescent substances and ethereal oils. *Donath, B. A. Ps. C.* 58 (1896) 609-.
- garnet. *Brun, A. Arch. Sc. Ps. Nt.* 28 (1892) 410-.
- gaseous mixtures. *Bacchi, P. N. Cim.* 9 (1899) 241-.
- gases. *Bacchi, P. N. Cim.* 9 (1899) 177-.
- graphic representation. *Vierordt, K. von. A. Ps. C.* 151 (1874) 119-.
- hæmatin (reduced). *Stokvis, B. J. (xii) Mbl. Nt.* 1 (1871) 157-.
- hollow wedge in study of. *Gladstone, J. H. B. A. Rp.* 38 (1868) (Sect.) 18.
- hydrobilirubin. *Vierordt, K. Z. Bl.* 9 (1873) 160-.
- identification of coloured inks by. *Doremus, C. A. Am. Ph. S. P.* 35 (1896) 71-.
- influence of solvent. *Kundt, A. Münch. Ak. Sb.* 7 (1877) 234-.
- iodine. *Müller, (Dr.) J. Pogg. A.* 70 (1847) 115-.
- , *Conroy, (Sir) J. [1876] R. S. P.* 25 (1877) 46-.
- , *Ebert, H. Erlang. Ps. Md. S. Sb.* 21 (1890) 3-.
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- and bromine above critical temperature. *Wood, R. W. Z. Ps. C.* 19 (1896) 689-.
- dissolved in carbon disulphide. *Abney, (Capt.) W. de W., & Festing, (Col.) —. R. S. P.* 34 (1883) 490-.
- gas. *Thalén, R. Stockh. Ak. Hndl.* 8 (1869) (No. 3) 12 pp.; *A. Ps. C.* 139 (1870) 503-.
- , *Morghen, A. Rm. R. Ac. Linc. T.* 8 (1864) 327-; *Spet. It. Mm.* 13 (1865) 127-.
- , experiments. *Hasselberg, B. St. Pét. Ac. Sc. Mm.* 36 (1889) *No.* 17, 50 pp.
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- lines and bands. *Rizzo, G. B. N. Cim.* 35 (1894) 132-.
- liquids. *Julius, W. H. Amst. Ak. Vs. M.* 8 (1891) 205-.
- , mixed. *Bostwick, A. E. Am. J. Sc.* 37 (1889) 471-.
- and magnetic properties of liquid oxygen. *Dewar, J. [1897] R. I. P.* 15 (1899) 555-.

- manganese superchloride ( $Mn_2Cl_7$ ). *Luck, E.* Fresenius Z. 8 (1869) 405.
- and their measurement. *Hodgkinson, A. Manch. Lt. Ph. S. Mm. & P.* 3 (1890) 223-.
- metals volatilized by oxyhydrogen flame. *Roberts-Austen, W. C., & Lockyer, J. N.* R. S. P. 23 (1875) 344-.
- of yttrium and cerium groups. *Soret, J. L.* C. R. 91 (1880) 378-.
- new. *Wolff, K. H.* (xii) Rpm. Anal. C. 2 (1882) 55-.
- nitrogen peroxide (liquid). *Kundt, A.* A. Ps. C. 141 (1870) 157-.
- , *Bell, L.* [1885] Am. C. J. 7 (1885-86) 32-.
- , changes due to increase of density. *Weiss, A. J.* Pogg. A. 112 (1861) 153-.
- nitrosyl chloride. *Magnanini, G.* Rm. B. Ao. Linc. Rd. 5 (1889) (Sem. 1) 908-; Z. Ps. C. 4 (1889) 427-.
- nitrous anhydride and nitric peroxide. *Moser, J.* A. Ps. C. 2 (1877) 139-.
- organic substances. *Phipson, T. L.* C. S. J. 7 (1869) 324-.
- , *Hartley, W. N., & Huntington, A. K.* Phil. Trans. 170 (1879) 257-; R. S. P. 29 (1879) 290-; 31 (1881) 1-.
- oxygen (low temperature spectrum). *Smyth, C. P.* [1880-81] Edinb. R. S. T. 30 (1883) 419-.
- , *Egorov, N. G.* C. R. 101 (1885) 1143-; Rs. Ps.-C. S. J. 17 (Ps.) (1885) 332-.
- , *Janssen, J. C. R.* 102 (1886) 1352-.
- , *Budde, E.* Berl. Ps. Gs. Vh. (1888) 89-.
- , *Janssen, J. C.* C. R. 106 (1888) 1118-; Par. S. Ps. Sé. (1888) 207-.
- , *Liveing, M., & Dewar, J.* C. N. 58 (1888) 163-.
- , *Janssen, J. C.* As. Fr. C. R. (1890) (Pt. 1) 165-.
- (liquid). *Liveing, G. D., & Dewar, J.* Ph. Mg. 34 (1892) 205-.
- (—) and air (liquid). *Olzewski, K.* Krk. Ak. (Mt.-Prz.) Rz. 16 (1887) 226-; Wien Ak. Sb. 95 (1887) (Ab. 2) 257-; Mh. C. (1887) 73-.
- and compounds. *Liveing, G. D., & Dewar, J.* R. S. P. 46 (1890) 222-.
- , large masses, luminous and ultra-violet spectrum. *Liveing, G. D., & Dewar, J.* Ph. Mg. 26 (1888) 286-.
- and ozone. *Dewar, J.* R. I. P. 12 (1889) 468-.
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- , *Hartley, W. N.* [1880] C. S. J. 39 (1881) 57-.
- and pernitric anhydride. *Chappuis, J.* Par. S. Ps. Sé. (1882) 130-.
- permanent gases, and their liquefaction, apparatus for. *Olzewski, K.* Cro. Ac. Sc. Bil. (1889) No. 1, xxviii.
- pernitric anhydride. *Chappuis, J.* C. B. 94 (1882) 946-.
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- rare earths. *Bailey, G. H.* B. A. Rp. (1887) 654-.
- , *Kiesewetter, P., & Krüss, G.* Berl. B. 21 (1888) 2310-.
- , *Exner, F. M.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 1252-.
- rays of high refrangibility. *Huntington, A. K.* B. A. Rp. (1880) 303-.
- samaraskite derivatives. *Soret, J. L.* C. R. 88 (1879) 422-.
- selenium, tellurium, etc. *Gernez, D.* C. R. 74 (1872) 1190-.
- sodium and other metals. *Secchi, A.* Palermo Mm. Spet. It. 2 (1878) 67-.
- , simple method of exhibiting spectrum. *Kreuzer, H.* C. Ztg. 23 (1899) 37-.
- sulpharsenate. *Formánek, J.* Prag Sb. (1888) (Mth. Nt.) 86-; Fschr. Ps. (1888) (Ab. 2) 57-.
- and solar spectrum, photomicrography. *Castellarnau, J. M. de.* [1889] Mcr. S. J. (1892) 424-.
- solutions (very dilute). *Knoblauch, O.* A. Ps. C. 43 (1891) 788-.
- (aqueous) of copper salts. *Ewan, T.* Ph. Mg. 33 (1892) 317-.
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- nitrogen peroxide, chlorine peroxide and chlorous acid. *Gernez, D.* C. R. 74 (1872) 465-.
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- same substance under different conditions. *Vogel, H. W.* Berl. B. 11 (1878) 913-, 1363-.
- (Vogel). *Moser, J.* Berl. B. 11 (1878) 1416-.
- (Moser). *Vogel, H. W.* Berl. B. 11 (1878) 1562-.
- sulphur vapour. *Salet, G.* C. R. 74 (1872) 865-.
- , and vapours of selenious acid and hypochlorous anhydride. *Gernez, D.* C. R. 74 (1872) 803-.
- sun near horizon, influence of density and thickness of oxygen layer in air. *Janssen, —.* Leip. As. Gs. Vjschr. 24 (1889) 244-.
- thin metallic films. *Dudley, W. L.* Am. C. J. 14 (1892) 185-.
- ultramaries. *Wunder, J.* Berl. B. 9 (1876) 295-.
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- , of liquids. *Soret, J. L.* Sch. Nf. Gs. Vh. 60 (1876-77) 51-.
- , — nitric and nitrous ethers. *Rilliet, A. A., & Soret, J. L.* C. R. 89 (1879) 747-.
- uranium salts, fluorescent and absorption spectra. *Bolton, H. C., & Morton, H.* Am. C. 3 (1873) 361-, 401-; 4 (1874) 1-, 41-, 81-.

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—, *Davis, W. M.* Science 4 (1884) 94.

—, *Provenzali, F. S.* Rm. N. Linc. At. 38 (1885) 9-.

—, *Fol, H.* As. (1891) 255-.

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- , —, —, in oxyhydrogen flame, apparatus for. *Pellin, —.* As. Fr. C. R. (1889) (Pt. 1) 259.
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- , —, —, and terrestrial, distinction between. *Cornu, A. L.* Ps. S. P. 8 (1887) 95-; Ph. Mg. 22 (1886) 458-.
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- — —. *Lewin, L.* Arch. Phm. 235 (1897) 245-.
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- — —, protection of eye from. *Schulek, V.* Mth. Term. Éts. 17 (1899) 510-; Mth. Nt. B. Ung. 17 (1901) 341.
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— — — compounds, relations. *Krüss, G.* Berl. B. 18 (1885) 1426; Z. Ps. C. 2 (1888) 312-; 18 (1895) 559-.

— — — — —, *Althausse, M., & Krüss, G.* Berl. B. 22 (1889) 2065-.

didymium and erbium salts. *Living, G. D.* [1899] Camb. Ph. S. P. 10 (1900) 213-; Camb. Ph. S. T. 18 (1900) 298-.

dilute solutions. *Ewan, T.* R. S. P. 57 (1895) 117-.

isomeric cresols, dihydroxybenzenes, and hydroxybenzoic acids. *Hartley, W. N.* C. S. J. 53 (1888) 641-.

and molecular structure of carbon compounds, relation. *Hartley, W. N.* [1890-85] C. S. J. 39 (1881) 153-; 41 (1882) 45-; 47 (1885) 685-.

— — — — — colourless organic compounds, relation. *Spring, W.* Brux. Ac. Bil. 33 (1897) 165-.

Absorption of ultra-violet by compounds of fatty series. *Soret, J. L., & Rilliet, A.* Arch. Sc. Ps. Nt. 23 (1890) 5-.

Atomic composition of liquids containing carbon, hydrogen and oxygen, influence on transmission of light. *Landolt, H. H.* A. Ps. C. 122 (1864) 545-; 123 (1864) 595-.

Colour of bodies and their chemical character, relations. *Sabatier, P.* Toul. Fac. Sc. A. 6 (1892) E, 38 pp.

— — di- and tri-phenyl methane dyes and chemical constitution, relation. *Rosenstiehl, A.* Mulhouse S. In. Bil. 64 (1894) 181-.

Critical coefficient and formula  $\frac{n-1}{d}$ , relations. *Nasini, R.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 2) 127-.

Dispersion equivalent of sulphur. *Schrauf, A.* A. Ps. C. 27 (1886) 300-.

— equivalents. *Dale, T. P., & Gladstone, J. H.* B. A. Rp. 36 (1866) (Sect.) 10.

— — — — —, *Gladstone, J. H.* R. S. P. 42 (1887) 401-.

— — — — — and constitutional formulæ. *Gladstone, J. H.* Nt. 36 (1887) 570.

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## Chemical Constitution and Refraction 3860

- Dispersion of esters. *Barbier, P., & Roux, L.* C. R. 112 (1891) 582-.
- formulae, experimental proofs. *Brühl, J. W.* Lieb. A. 236 (1886) 233-; Berl. B. 19 (1886) 2821-.
- , molecular. *Gladstone, J. H.* Nt. 48 (1891) 198.
- of organic compounds. *Barbier, P., & Roux, L.* C. R. 111 (1890) 180-, 235-.
- — — (Barbier & Roux). *Nasini, R.* Rm. B. Ac. Linc. Rd. 6 (1890) (Sem. 1) 211-.
- Dispersive power of salts in solution. *Walter, B.* Hamb. Ws. Anst. Jb. 9 (Pt. 1) (1891) 245-.
- Gladstone's law. *Hibbert, W.* L. Ps. S. P. 13 (1895) 870-; Ph. Mg. 40 (1895) 321-.
- — —, and variation of molecular index. *Dufet, H.* Fr. S. Mn. Bil. 8 (1885) 408-; J. de Ps. 4 (1885) 477-, 535-.
- Ketteler's dispersion formula, constants for rock salt in. *Langley, S. P.* Smiths. I. Asps. Obs. A. 1 (1900) 261-.
- Molecular force, laws. *Sutherland, W.* Aust. As. Rp. (1898) 39-; (1890) 368-.
- rotation and deviation. *Guye, P. A.* C. B. 120 (1895) 876-.
- Jena. *Swift, J.* Mer. S. J. (1888) 496.
- , list of varieties. *Caplati, A.* Mer. S. J. (1890) 398-.
- , properties. *Hbëgh, E. von.* Catg. Opt. 8 (1887) 13-.
- manufacture. *Faraday, M.* [1829] Phil. Trans. (1830) 1-.
- *Simms, W. H.* As. S. M. Not. 9 (1848-49) 147-.
- , improvements. *Holley, G. W.* [1881] Franklin I. J. 118 (\*1884) 182-.
- , —. *Schneider, R.* Civing. 34 (1888) 465-.
- new. *Eder, J. M.* Wien Pht. Cor. 24 (1887) 1-.
- objectives. *Anon.* Mer. S. J. 6 (1886) 316- and photographic objectives. *Miethe, A.* Wien Pht. Cor. 35 (1898) 452-.
- production in electric furnaces. *Mach, L.* Wien Az. 37 (1900) 122-.
- recent inventions. *Foerster, F.* Civing. 41 (1895) 387-.
- reflection and transmission of light by certain kinds. *Conroy, (Sir) J.* [1888] Phil. Trans. (A) 180 (1890) 245-.
- refractive indices of several kinds. *Mascart, É.* A. C. 14 (1868) 144-.

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- (Ritchie's.) *Simms, W. H.* [1839] As. S. Mm. 11 (1840) 165-.
- Gotz, J. R.* [1892] Mer. S. J. (1893) 255-.
- Abbe's work. *Doll, —.* [1894] Karlsruhe Nt. Vr. Vh. 11 (1896) (Sb.) 267-.
- clear, production in Siemens's furnace. *Mach, L.* Wien Az. 37 (1900) 125-.
- coloured and colourless, absorption spectra. *Eder, J. M., & Valenta, E.* Wien Ak. D. 61 (1894) 285-.
- — —, transmission of light. *Spring, W.* Brux. Ac. Bil. (1900) 1014-.
- composition. *Kerckhoff, P. J. van.* Arch. Néerl. 6 (1871) 177-; Amst. Vs. Ak. 5 (1871) (Nik.) 181-.
- and connection between chemical constitution and optical properties (Harcourt's researches). *Stokes, G. G.* B. A. Rp. 41 (1871) (Sect.) 38-.
- crown- and flint-, composition. *Kerckhoff, P. J. van.* [1871] Harl. Arch. Ms. Teyl. 3 (1874) 117-.
- — —, invention. *Guinand, A.* As. Nr. 8 (1831) 841-.
- dispersion. *Merz, S. von.* (xii) Z. Instk. 2 (1882) 176-.
- effect of cooling; manufacture of compressed lenses. *Schott, —, et alii.* Z. Instk. 10 (1890) 41-.
- heavy crystal- (of Dufourgerais). [*Prony, R. de, Guyton de Morveau, —, & Rochon, A.* Par. Bil. S. Encour. 8 (1809) 104-.
- — —. [*Delambre, —, Charles, —, Burckhardt, —, & Gay-Lussac, L. J.* Gilbert A. 34 (1810) 460-.
- for instruments. *Bourne, A.* Silliman J. 40 (1841) 207-.
- Jena. *Czapski, S.* Z. Instk. 6 (1886) 293-, 335-.

- Optical properties of bodies and their characteristic equation. *Januschke, H.* Exner Rpm. 27 (1891) 781-.
- — — phenyl thiocarbimide. *Madan, H. G.* L. Ps. S. P. 9 (1888) 262-.
- — — phosphorus. *Gladstone, J. H., & Dale, T. P.* [1858] Ph. Mg. 18 (1859) 30-.

## REFRACTION.

- Eijkman, J. F.* Rec. Tr. C. P.-Bas 12 (1898) 157-, 268-; 13 (1894) 13-; 14 (1895) 185-; 15 (1896) 52-.
- atomic, of antimony, lead and tin. *Ghira, A.* Rm. B. Ac. Linc. Rd. 3 (1894) (Sem. 1) 332-.
- , — boron. *Ghira, A.* Rm. B. Ac. Linc. Rd. 2 (1893) (Sem. 1) 312-.
- , calculation for sodium light. *Conrady, E.* Z. Ps. C. 3 (1889) 210-.
- , of carbon. *Nasini, R.* Rm. B. Ac. Linc. Rd. 1 (1885) 78-.
- , — —, hydrogen, oxygen and the halogens. *Traube, J.* Berl. B. 80 (1897) 89-.
- , — elements for D line. *Zecchini, F.* Gz. C. It. 22 (1892) (Pt. 2) 592-.
- , — mercury. *Ghira, A.* Rm. B. Ac. Linc. Rd. 3 (1894) (Sem. 1) 297-.
- , — nitrogen. *Traube, J.* Berl. B. 80 (1897) 43-.
- , — oxygen. *Anderlini, F.* Gz. C. It. 25 (1895) (Pt. 2) 127-.
- , and relation between dispersion and chemical constitution. *Brühl, J. W.* Z. Ps. C. 7 (1891) 140-.
- , of selenium. *Zoppellari, I.* Rm. B. Ac. Linc. Rd. 3 (1894) (Sem. 2) 330-.
- , — sulphur. *Nasini, R.* Berl. B. 15 (1882) 2878-; Rm. B. Ac. Linc. Rd. 1 (1885) 74-.

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and chemical composition of gases and vapours. *Brühl, J. W.* Z. Ps. C. 7 (1891) 1-.

— constitution. *Gladstone, J. H.* [1877] R. I. P. 8 (1879) 351-.

— — — and density of organic substances. *Brühl, J. W.* D. Nf. Tbl. (\*1879) 187-; Lieb. A. 200 (1880) 189-; 203 (1880) 1-, 255-, 363-.

— equivalent, relation between. *Gladstone, J. H.* R. S. P. 60 (1897) 140-.

— density of gaseous elements and compounds. *Dale, (Rev.) T. P.* L. Ps. S. P. 10 (1890) 189-; Ph. Mg. 28 (1889) 268-.

equations. *Pagliani, S.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 2) 107-.

## EQUIVALENTS.

*Gladstone, J. H.* R. S. P. 16 (1868) 489-; R. I. P. 5 (1869) 371-; C. S. J. 8 (1870) 101-; As. Fr. C. R. 1 (1872) 361-; Am. J. Sc. 29 (1885) 55-.

*Exner, F.* Exner Bpm. 21 (1885) 849-; Wien Ak. Sb. 91 (1885) (Ab. 2) 850-; Mh. C. (1885) 249-.

(CH<sub>2</sub>) *Landolt, H.* Z. Ps. C. 4 (1889) 418-.

aromatic hydrocarbons, and their derivatives. *Gladstone, J. H.* C. S. J. 8 (1870) 147-.

carbon. *Gladstone, J. H.* B. A. Bp. 35 (1865) (Sect.) 11.

— compounds. *Gladstone, J. H.* As. Fr. C. R. 10 (1881) 330-.

— — — and diamonds. *Gladstone, J. H.* B. A. Bp. (1880) 535-.

—, hydrogen and oxygen. *Landolt, H. H.* Halle Z. Nw. 40 (1872) 303.

and chemical theory. *Gladstone, J. H.* B. A. Bp. 38 (1868) (Sect.) 37-.

double bonds, influence of halogens. *Carrara, G.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 1) 353-.

elements. *Gladstone, J. H.* [1869] Phil. Trans. 160 (1870) 9-.

— *Hauke, A.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 749-.

— in organic compounds. *Gladstone, J. H.* R. S. P. 31 (1881) 327-.

organic compounds. *Gladstone, J. H.* C. S. J. 45 (1884) 241-.

— *Nasini, R.* Rm. R. Ac. Linc. Mm. 19 (1884) 195-.

salts in solution. *Gladstone, J. H.* C. N. 16 (1867) 150.

and volume equivalents. *Ketteler, E.* Z. Ps. C. 2 (1888) 905-.

formulae, Ketteler's, application. *Nasini, R.* [1890] Gz. C. It. 21 (1891) (Pt. 1) 381-.

mixtures of alcohol and water. *Dziewulski, E.* [1881] (XII) Krk. Ak. (Mt.-Prz.) Pam. 8 (1883) 113-.

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## MOLECULAR REFRACTION.

*Wiedemann, E. E. G. A.* Ps. C. 17 (1882) 577-.

*Sutherland, W.* Aust. As. Rp. (1888) 42-; Ph. Mg. 27 (1889) 141-.

brominated ethanes and ethylenes. *Weegmann, R.* Z. Ps. C. 2 (1888) 218-, 257-.

citraconic and mesaconic esters. *Brühl, J. W.* Berl. B. 14 (1881) 2736-.

compounds containing nitrogen. *Loewenherz, R.* Z. Ps. C. 6 (1890) 552-.

constants of crystallised salts. *Pope, W. J.* Z. Kr. 28 (1897) 118-.

and critical constant, relation. *Guye, P. A.* Par. S. Ps. Sé. (1890) 17-.

dependence on chemical constitution. *Schröder, H.* Berl. B. 14 (1881) 2513-; 15 (1882) 994-; Münch. Ak. Sb. 12 (1882) 57-; A. Ps. C. 16 (1888) 148-.

dissolved salts. *Doumer, E. C. R.* 110 (1890) 957-; Par. S. C. Bll. 8 (1890) 200-.

— — — and acids. *Gladstone, J. H., & Hibbert, W.* B. A. Bp. (1895) 637; C. S. J. 67 (1895) 831-; 71 (1897) (Pt. 2) 822-.

hydrocarbons, supposed influence of multiple linkages. *Thomsen, J.* Berl. B. 19 (1886) 2387-.

and molecular weight, change. *Janovsky, J. V.* Wien Ak. Sb. 81 (1880) (Ab. 2) 539-; 82 (1881) (Ab. 2) 147-.

— — —, — (Janovsky). *Brühl, J. W.* Berl. B. 14 (1881) 1306-.

nitrates. *Loewenherz, R.* Berl. B. 28 (1890) 2180-.

organic compounds (liquid). *Landolt, H. H.* Berl. Ak. Sb. (1882) 64-.

— — — (for infinitely long wave-lengths). *Landolt, H., & Jahn, H.* Berl. Ak. Sb. (1892) 729-.

— *Jahn, H., & Möller, G.* Z. Ps. C. 13 (1894) 385-.

— *Brühl, J. W.* Berl. B. 30 (1897) 158-.

— — — of high dispersive power. *Nasini, R.* Rm. R. Ac. Linc. Rd. 3 (1887) (Sem. 1) 128-, 164-.

— cyanides and isocyanides. *Costa, T.* Rm. R. Ac. Linc. Rd. 7 (1891) (Sem. 2) 308-.

— liquids of high dispersive power. *Brühl, J. W.* Lieb. A. 235 (1886) 1-; Berl. B. 19 (1886) 2746-.

— thiocyanates, isothiocyanates and thiophen. *Nasini, R., & Scala, A.* Rm. R. Ac. Linc. Rd. 2 (1886) (Sem. 1) 617-.

salts and their solutions. *Gladstone, J. H.* As. Fr. C. R. (1893) (Pt. 1) 200-; (1895) (Pt. 2) 468-.

solids in solution. *Schütt, F.* Z. Ps. C. 5 (1890) 349-; 9 (1892) 349-.

and specific refraction, new formula. *Edwards, W. F.* Am. C. J. 16 (1894) 625-.

sulphur and carbon compounds. *Nasini, R., & Scala, A.* Rm. R. Ac. Linc. Rd. 2 (1886) (Sem. 1) 623-.

Thomsen's supposed explanation of the conditions. *Brühl, J. W.* Berl. B. 19 (1886) 3103-.

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- organic compounds, singular case. *Nasini, R., & Costa, T.* Rm. R. Ac. Linc. Bd. 6 (1890) (Sem. 2) 259-.
- relation to density and atomic weight of bodies. *Schmidt, C. A.* Z. Nw. 9 (1874) 288-.
- and rotation of chemical compounds. *Kanonnikov, I.* J. Pr. C. 49 (1894) 137-.
- selenates of potassium, rubidium and caesium. *Tutton, A. E.* C. S. J. 71 (1897) (Pt. 2) 846-.
- selenium and bromine, upper limit. *Dale, (Rev.) T. P.* L. Ps. S. P. 10 (1890) 17-; Ph. Mg. 27 (1889) 50-.
- specific, of elements and their compounds. *Gladstone, J. H.* C. S. J. 3 (1865) 108-.
- , influence of double linkage. *Nasini, R.* Rm. R. Ac. Linc. T. 8 (1884) 169-, xvi.
- , of liquids, new formula. *Zecchini, F.* Gz. C. It. 25 (1895) (Pt. 2) 269-.
- , and molecular weight, relation between. *Guye, P.* Arch. Sc. Ps. Nt. 23 (1890) 183-.
- , — the periodic law. *Gladstone, J. H.* B. A. Rp. (1895) 609-.
- , of solids, determination from their solutions. *Brit. Ass. Comm.* B. A. Rp. (1881) 155-.
- REFRACTION AND DISPERSION.**
- equivalents. *Gladstone, J. H.* Arch. Sc. Ps. Nt. 16 (1886) 192-.
- , of chlorine, bromine and iodine. *Gladstone, J. H.* B. A. Rp. 36 (1866) (Sect.) 37.
- of fluorbenzene and allied compounds. *Gladstone, J. H., & Gladstone, G.* Ph. Mg. 31 (1891) 1-.
- in isomorphous biaxial crystals. *Perrot, F. L.* [1890-92] Arch. Sc. Ps. Nt. 25 (1891) 26-; 29 (1893) 28-, 121-.
- molecular. *Gladstone, J. H.* C. S. J. 59 (1891) 290-.
- , of very dilute solutions. *Dijken, D.* Z. Ps. C. 24 (1897) 81-.
- , recent determinations. *Gladstone, J. H.* L. Ps. S. P. 12 (1894) 153-; Ph. Mg. 35 (1893) 204-.
- , of substances in solution. *Gladstone, J. H.* C. S. J. 59 (1891) 589-.
- of various organic compounds. *Perkin, W. H.* C. S. J. 69 (1896) 1025-, [1756].
- relations, and chemical composition, connection. *Mitscherlich, E.* Berl. B. (1846) 86.
- and sensitiveness of liquids. *Gladstone, J. H., & Dale, T. P.* Phil. Trans. (1863) 317-.
- of silver iodide, bromide and chloride. *Wernicke, W.* A. Ps. C. 142 (1871) 560-.
- — — — — (Wernicke). *Schultz-Sellack, C.* A. Ps. C. 144 (1872) 331-.
- specific. *Gladstone, J. H.* As. Fr. C. R. (1885) (Pt. 2) 270-.
- , of alums. *Gladstone, J. H.* L. Ps. S. P. 7 (1886) 194-; Ph. Mg. 20 (1885) 162-.
- , — isomeric bodies. *Gladstone, J. H.* [1880] L. Ps. S. P. 4 (1881) 94-; Ph. Mg. 11 (1881) 54-.
- , — liquids. *Gladstone, J. H.* B. A. Rp. (1881) 591.

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- Refractive and dispersive energy, specific, of essential oils. *Gladstone, J. H.* C. S. J. 49 (1886) 609-.
- energies and combining proportions of metals, relation. *Gladstone, J. H.* B. A. Rp. 39 (1869) (Sect.) 22-.
- energy and molecular volume of some sodium salts. *Dufet, H.* Par. S. Ps. Sé. (1887) 117-.
- , specific. *Dale, T. P., & Gladstone, —.* B. A. Rp. (1863) (pt. 2) 12-.

### REFRACTIVE INDICES.

- camphors and allied substances. *Brühl, J. W.* Berl. B. 32 (1899) 1222-.
- compound ethers. *Delfs, W.* Pogg. A. 81 (1850) 470-.
- and density and boiling point of some organic liquids. *Delfs, W.* Lieb. A. 92 (1854) 277-.
- , molecular weight and diathermancy, connection between. *Aymonnet, —.* C. R. 118 (1891) 418-.
- homologous compounds. *Landolt, H. H.* Pogg. A. 117 (1862) 852-; Rheinl. Westphal. Sb. 19 (1862) 180-.
- isomorphous biaxial crystals. *Perrot, F. L.* [1892] Arch. Sc. Ps. Nt. 29 (1893) 28-, 121-.
- mixtures. *Dufet, H.* C. R. 99 (1884) 990-.
- , in relation to chemical composition. *Fock, A.* (xii) Z. Kr. 4 (1880) 533-.
- mixture of two fluids, calculation. *Hoek, M.* Pogg. A. 112 (1861) 347-.
- normal salt solutions. *Bender, C.* A. Ps. C. 39 (1890) 89-; A. Ps. 2 (1900) 186-.
- — — and water. *Bender, C.* A. Ps. C. 68 (1899) 343-; 69 (1899) 876-.
- organic compounds, relation to chemical constitution. *Bernheimer, O., & Nasini, R.* Rm. R. Ac. Linc. T. 7 (1883) 227-; Rm. R. Ac. Linc. Mm. 18 (1883) 606-.
- substances. *Kanonnikov, I.* J. Pr. C. 82 (1885) 497-.
- salt solutions. *Walter, B.* A. Ps. C. 38 (1889) 107-; C. R. 110 (1890) 708-.
- substitution products of carbonic ether. *Wiedemann, E.* J. Pr. C. 114 (1873) 453-.

### REFRACTIVE POWER.

- anomalous, of phenylic bases. *Zecchini, F.* Rm. R. Ac. Linc. Bd. 2 (1893) (Sem. 1) 491-.
- benzenoid hydrocarbons. *Perkin, W. H.* C. S. J. 77 (1900) (Pt. 1) 267-.
- bodies. *Marx, C. M.* Schweigger J. 52 (=Jb. 22) (1828) 386-.
- and calorific power, relation. *Montigny, C.* [1866] Brux. Mm. Cour. 8vo, 19 (1867) (No. 2) 41 pp.
- chemical constitution, relation. *Mohr, C. F.* D. C. Gs. B. 4 (1871) 149-; Z. Mth. Ps. 16 (1871) 492-.
- — — — —. *Kanonnikov, I. I.* (xii) Rs. Ps. C. S. J. 15 (Pt. 1) (1883) 484-; (x) Berl. B. 16 (1883) 3047-.

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and chemical constitution, relation. *Nasini, R.* [1899] *Ven. I. At.* (1899-1900) (Pt. 2) 211-.

— — —, theory. *Nasini, R.* *Gz. C. It.* 20 (1891) 1-.

*meta-cinnamene.* *Madan, H. G.* *C. S. P.* 1 (1885) 106-, iii.

and composition, relations. *Kanonnikov, I.* *Rs. Ps.-C. S. J.* 16 (C.) (1884) 119-; *Berl. B.* 17 (1884) (Ref.) 157-.

— — —, *Flavickij, F.* *Rs. Ps.-C. S. J.* 16 (C.) (1884) 260-.

— — —, *Kanonnikov, I. I.* *Rs. Ps.-C. S. J.* 16 (C.) (1884) 448-.

compounds. *Kanonnikov, I. J. Pr. C.* 81 (1885) 321-; 32 (1885) 497-.

— containing the carbonyl radicle. *Nasini, R.; & Anderlini, F.* [1893] *Ven. I. At.* (1893-94) 307-.

—, influence of simple and multiple union, constitution of benzene and naphthalene compounds. *Brühl, J. W.* *Berl. B.* 20 (1897) 2288-.

constancy. *Ketteler, E. A.* *Ps. C.* 30 (1887) 285-.

and dispersive power of aromatic compounds, relations. *Costa, T.* *Rm. R. Ac. Linc. Mm.* 6 (1889) 248-.

— — — silicon in its compounds. *Abati, G.* *Gz. C. It.* 27 (1897) (Pt. 2) 437-.

gases. *Dulong, P. L.* [1825] *Par. Mm. Ac. Sc.* 7 (1827) 345-.

—, inactive. *Ramsay, W.* *Arch. Néerl.* 5 (1900) 356-.

—, mixtures. *Ramsay, W., & Travers, M. W.* *B. A. Rp.* (1897) 587-; *R. S. P.* 62 (1898) 225-.

high, of some organic substances. *Madan, H. G. L. Ps. S. P.* 7 (1886) 364-; *Ph. Mg.* 21 (1886) 245-.

influence of electrolytic dissociation and of solvent. *Le Blanc, M., & Rohland, P. Z.* *Ps. C.* 19 (1896) 261-.

investigation of co-existing phases in mixtures of acetone and ether by. *Cunæus, E. H. J.* *Amst. Ak. Vs.* 8 (1900) 191-, 502; *Amst. Ak. P.* 2 (1900) 101-, 408.

liquid mixtures. *Zecchini, F.* *Gz. C. It.* 27 (1897) (Pt. 1) 358-.

liquids. *Fabri, R., & Farini, L.* *Bologna Ac. Sc. Mm.* 6 (1884) 23-.

metallic carbonyls. *Ferreira de Silva, A. I.* *Par. S. C. Bll.* 15 (1896) 835-.

— (Ferreira de Silva). *Nasini, R.* *Ven. I. At.* (1896-97) 1087-.

mixtures. *Perkin, W. H. C. S. J.* 77 (1900) (Pt. 1) 267-.

organic compounds, influence of structure. *Kanonnikov, I. I.* (xii) *Kazan Un. Mm.* (1880) (Pt. 2) 179-; (x) *Berl. B.* 14 (1881) 1697-.

— in solutions. *Kanonnikoff, J.* *J. Pr. C.* 27 (1883) 362-.

organo-metallic compounds. *Ghira, A.* *Rm. R. Ac. Linc. Rd.* 3 (1894) (Sem. 1) 391-.

phosphorus. *Zecchini, F.* *Rm. R. Ac. Linc. Rd.* 1 (1892) (Sem. 2) 433-; 2 (1893) (Sem. 1) 31-, (Sem. 2) 193-.

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for ray of infinite wave-length. *Nasini, R.* *Rm. R. Ac. Linc. Rd.* 2 (1893) (Sem. 1) 161-.

solutions. *Sundvik, E. E.* *Helsingf. Öfv.* 39 (1897) 1-.

and specific inductive capacity. *Pagliani, S.* *Rm. R. Ac. Linc. Rd.* 2 (1893) (Sem. 2) 48-.

tellurium derivatives. *Pellini, G., & Menin, A.* *Gz. C. It.* 30 (1900) (Pt. 2) 465-.

triethylsulphine derivatives. *Nasini, R., & Costa, T.* *Rm. R. Ac. Linc. Rd.* 6 (1890) (Sem. 2) 284-.

Refractometer, and experiments with solutions. *Hallwachs, W.* *Dresden Isis Sb.* (1898) (Ab.) 49-.

Tautomerism. *Brühl, J. W. J. Pr. C.* 50 (1894) 119-.

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(Diffraction.) *Shvedov, T. N.* (xii) *Rs. C. Ps. S. J.* 7 (Ps.) (1875) [(Pt. 1)] 101-; 8 (Ps.) (1876) [(Pt. 1)] 145-; 9 (Ps.) (1877) [(Pt. 1)] 94-.

(Shvedov's theory.) *Khvol'son, O. D.* (xii) *Rs. C. Ps. S. J.* 7 (Ps.) (1875) [(Pt. 1)] 132-; 8 (Ps.) (1876) [(Pt. 1)] 428-.

(Reflection.) *Shvedov, T. N.* (xii) *Rs. C. Ps. S. J.* 8 (Ps.) (1876) [(Pt. 1)] 176-.

## ABSORPTION.

anomalous, and chemical constitution. *Drude, P.* *Leip. Mth. Ps. B.* 48 (1896) 431-; *A. Ps. C.* 60 (1897) 500-.

—, theory. *Drude, P.* *Leip. Mth. Ps. B.* 49 (1897) 549-.

of electromagnetic waves. *Righi, A.* *Rm. R. Ac. Linc. Rd.* 6 (1897) (Sem. 1) 214-.

and emission of waves by resonance. *Planck, M.* *Berl. Ak. Sb.* (1895) 289-.

of Röntgen rays. *Buguet, A.* *C. R.* 125 (1897) 898-.

— — —. *Humphreys, W. J.* *Ph. Mg.* 44 (1897) 401-.

— — — by air. *Trowbridge, J., & Burbank, J. E.* *Sc. Abs.* 2 (1899) 665.

— — — aqueous salt solutions. *Blythwood, (Lord), & Marchant, E. W.* *R. S. P.* 65 (1900) 413-.

— — — chemical compounds. *Gladstone, J. H., & Hibbert, W.* *C. N.* 78 (1898) 199-.

— — — gases and vapours, and electrification of gases exposed to Röntgen rays. *Rutherford, E.* *Ph. Mg.* 43 (1897) 241-.

— — — glass. *Nannes, G.* *Stockh. Öfv.* (1896) 505-.

selective, of Röntgen rays. *McClelland, J. A.* *B. S. P.* 60 (1897) 146-.

## 3875 Electric Radiation, Refraction, etc.

## Polarisation 4000

- of short waves by water. *Drude, P.* A. Ps. C. 65 (1898) 499-.
- transparency of bodies for Röntgen rays, law. *Benoist, L.* C. R. 124 (1897) 146-; Par. S. Ps. Sé. (1897) 21-.
- of waves by liquids. *Branly, É.* Par. S. Ps. Sé. (1900) 9-.
- — non-metallic bodies. *Branly, É., & Le Bon, G.* C. R. 128 (1899) 879-.

Physical behaviour of substances containing hydroxyl. *Guillaume, C. É.* A. Tél. 28 (1896-97) 390-.

Polarisation by doubly refracting crystals. *Bose, J. C.* Beng. As. S. J. 64 (Pt. 2) (1896) 291-.

## REFLECTION.

- Goldstein, E.* Berl. Ak. Mb. (1881) 775-.
- diffuse, of Röntgen rays. *Pupin, M. I.* Science 3 (1896) 588-.
- — — — — *Thomson, J. J.* Camb. Ph. S. P. 9 (1898) 393-.
- of Röntgen rays. *Blythwood, (Lord).* R. S. P. 59 (1896) 330-.
- — — — — *Dwelschawers-Dery, F. V.* Brux. Ac. Bll. 31 (1896) 482-.
- — — — — (Blythwood). *Kelvin, (Lord).* R. S. P. 59 (1896) 332-.
- — — — — *Lea, M. C.* Science 4 (1896) 917.
- — — — — *Malagoli, R., & Bonacini, C.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 1) 327-.
- — — — — from platinum. *Rood, O. N.* Science 3 (1896) 463-.
- — — — — Rood's demonstration. *Mayer, A. M.* Science 3 (1896) 705-.
- — — — — polished metallic surfaces. *Rood, O. N.* Am. J. Sc. 2 (1896) 178-.
- total. *Bose, J. C.* R. S. P. 62 (1898) 800-.

## REFRACTION.

- Gutroul, A.* Lum. Élect. 4 (\*1881) 330-.
- Dispersion. *Marx, E.* A. Ps. C. 66 (1898) 411-, 597-.
- — — — — *Graetz, L., & Fomm, L.* A. Ps. C. 66 (1898) 1196-.
- — — — — anomalous, of fluids. *Drude, P.* Leip. Mth. Ps. Ab. 23 (1897) 1-.
- — — — — theory. *Drude, P.* Leip. Mth. Ps. B. 49 (1897) 549-.
- — — — — in glasses, organic acids and esters. *Löwe, K. F.* A. Ps. C. 66 (1898) 390-, 582-.
- Double refraction. *Mack, K.* A. Ps. C. 54 (1895) 342-.
- — — — — (Mack). *Bezold, W. von.* A. Ps. C. 54 (1895) 752-.
- — — — — *Righi, A.* A. Ps. C. 55 (1895) 389-.
- — — — — *Lebedev, P.* Rs. Ps.-C. S. J. 27 (Ps.) (1895) 213-; A. Ps. C. 56 (1895) 1-.
- — — — — *Mack, K.* A. Ps. C. 56 (1895) 717-.
- — — — — dielectric. *Blondlot, R.* J. de Ps. 7 (1888) 91-.
- — — — — of wood for electromagnetic waves. *Mazzotto, D.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 2) 73-.

- Refractive indices of glass. *Bose, J. C.* R. S. P. 62 (1898) 293-.
- — — — — gypsum for electromagnetic waves. *Righi, A.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 1) 324-.
- — — — — liquids for waves, method of demonstration. *Drude, P.* Leip. Mth. Ps. B. 47 (1895) 329-.
- — — — — for short waves. *Lampa, A.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 587-, 1049-.
- — — — — of water. *Ellinger, H. O. G.* A. Ps. C. 46 (1892) 513-, 680.
- — — — — and aqueous solutions. *Drude, P.* Leip. Mth. Ps. B. 48 (1896) 315-.
- — — — — for waves 2 metres to 25 centimetres in length. *Mazzotto, D.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 2) 301-.
- Röntgen rays. *Beaulard, F.* C. R. 122 (1896) 782.
- — — — — in prism. *Hurion, —, & Izarn, —.* C. R. 122 (1896) 1195-.
- — — — — refraction and diffraction. *Gouy, —.* C. R. 122 (1896) 1197-; 123 (1896) 43-; J. de Ps. 5 (1896) 345-.
- — — — — reflection. *Evans, W. P.* [1896] N. Z. I. T. 29 (1897) 573-.

## POLARISATION.

(See also Mineralogy 400-440.)

## 4000 General. Instruments and Methods.

- Mayer, J. T.* [1812] Gött. Cm. 2 (1811-18) 43 pp.
- Mumcke, G. W.* Gilbert A. 57 (1817) 203-.
- Schweigger, J. S. C.* Schweigger J. 21 (1817) 113-.
- Biot, J. B.* Par. S. Phlm. Bll. (1818) 148.
- Mumcke, G. W.* Gilbert A. 66 (1820) 412-.
- Anon.* (vi 607) Gleanings Sc. 2 (1830) 105-.
- Arago, D. F. J.* Par. Bur. Long. An. (1831) 151-.
- Delezenne, —.* Lille Mm. S. (1834) 238-, 594-; (1835) 5-.
- Spottiswoode, W.* [1873-74] (xi) Nt. 9 (1874) 127-, 167-, 203-, 282-, 323-, 383-, 464-, 507-; 10 (1874) 125-.
- Depolarisation. *Dove, H. W.* Pogg. A. 71 (1847) 115-.
- — — — — *Kundt, A.* A. Ps. C. 123 (1864) 385-.
- — — — — by various bodies. *Brewster, (Sir) D.* [1814] Phil. Trans. (1815) 29-.
- — — — — in traversing crystal, apparent. *Péchar-dergne, —.* [1859] (viii) Bordeaux Mm. S. Sc. 4 (cah. 2) (1866) 102-.
- Depolarised light, distinction from natural light. *Poggendorff, J. C.* Pogg. A. 35 (1835) 448-.
- Experiment. *Airy, (Sir) G. B.* (vi Add.) Ph. Mg. 10 (1831) 141-.
- — — — — Huygens's, applications. *Stroumbo, S.* Les Mondes 34 (1874) 562-.



- Experiments. *Haldat du Lys*, C. N. A. de Nancy Mm. S. Sc. (1837) 83-.
- (with quartz, etc.). *Babinet*, J. C. R. 8 (1839) 762.
- *Rosenbach*, —. Bresl. Schl. Gs. Jbr. (1898) (*Ab. 2a*) 17-.
- *Hnitzs*, —. Bresl. Schl. Gs. Jbr. (1898) (*Ab. 2a*) 19-.
- , fundamental. *König*, W. Frkf. a. M. Ps. Vr. Jbr. (1892-98) 26-.
- Indicatrix, optical, and transmission of light in crystals. *Fletcher*, L. [1891] Mn. Mg. 9 (1892) 278-, [404].

## INSTRUMENTS AND METHODS.

- Apparatus. *Bruhns*, G. Z. Vr. D. Zuckin. 49 (1899) (*Th.* 2) 452-.
- for crystals. *Schneider*, E. Carl Rpm. 15 (1879) 744-.
- with 2 division lines in field of sight. *Frič*, Jo., & *Frič*, Ja. Z. Zuckin. Böhm. 18 (1898-94) 622-.
- for elliptically polarised light. *Dove*, H. W. B. A. Rp. (1854) (*pt.* 2) 9.
- — experiments. *Schulze-Montanus*, —. Gilbert A. 56 (1817) 427-.
- — —. *Umov*, —. Par. S. Ps. Sé. (1899) 25\*.
- with glass scale, new. *Frič*, Jo., & *Frič*, Ja. Z. Zuckin. Böhm. 23 (1898-99) 501-.
- , Heele's new. *Gumlich*, E. Z. Instk. 16 (1896) 269-, 352.
- , magnesium platino-cyanide. *Lommel*, E. C. J. Erlang. Ps. Md. S. Sb. 13 (1881) 81-.
- , modified. *Reusch*, F. E. Pogg. A. 92 (1854) 336.
- , Nörremberg's, modification. *Schinz*, E. Sch. Gs. Vh. (1846) 38-.
- , novelties in. *Wicke*, W. Mcr. S. J. (1898) 233-.
- for plane, elliptic and circular polarisation. *Dove*, H. W. Pogg. A. 35 (1835) 596-.
- — polarised light, without Iceland spar. *Cheyney*, J. S. Mcr. S. J. (1900) 719-.
- , simple form. *Cook*, J. Nt. 60 (1899) 8.
- Axes of doubly refracting crystals, arrangement for distinguishing. *Sorby*, H. C. M. Mcr. J. 18 (1877) 209-.
- Colorimeter, polarisation-. *Krüss*, H. Z. Ps. C. 10 (1892) 165-.
- Compensation of optical difference of path. *Sirks*, J. L. A. Ps. C. 140 (1870) 621-; 141 (1870) 898-.
- Compensator, Babinet, construction. *Schmidt*, K. E. F. Z. Instk. 11 (1891) 439-; 12 (1892) 80; A. Ps. C. 45 (1892) 377-.
- , —, theory. *Schmidt*, K. E. F. A. Ps. C. 35 (1888) 360-.
- for polarimetry. *Wulff*, G. V. Ra. Ps.-C. S. J. 20 (*Ps.*) (1888) 20-; J. de Ps. 8 (1889) 585-.
- Dichroscope. *Haidinger*, W. Wien SB. (1848) 70-.
- *Dove*, H. W. Pogg. A. 110 (1860) 265-.
- , improvement. *Cathrein*, A. Z. Instk. 16 (1896) 225-.
- , Sorby's. *Anon.* Mcr. S. J. 5 (1885) 121-.
- Double-rotation apparatus, optical properties. *Biot*, J. B. C. R. 21 (1845) 453-.
- Elliptic polarisation of light reflected from metals, instrument for measuring. *MacCullagh*, J. [1838] Ir. Ac. P. 1 (1836-40) 158-.
- Gratings, polarising. *Du Bois*, H. E. J. G. B. A. Rp. (1892) 660.
- Lenses and systems of lenses for observation of coloured rings in polarised light. *Reusch*, F. E. (*vi Adds.*) D. Nf. Vsm. B. 34 (1858) 160-.
- Leukoscope. *Brodhun*, E. A. Pa. C. 34 (1888) 897-.
- Microscope, arrangement to shew axial images of doubly refracting bodies. *Dippel*, L. Z. Ws. Mkr. 17 (1900) 145-.
- , — — rings of crystals. *Stone*, W. H. L. Ps. S. P. 1 (1876) 84-; Ph. Mg. 48 (1874) 188.
- , polarisation-, for axial angles. *Schneider*, E. Carl Rpm. 15 (1879) 119-.
- , —, and determination of character of double refraction. *Klein*, C. Berl. Ak. Sb. (1893) 221-.
- , —, Nörremberg's. *Bertin*, A. A. C. 69 (1863) 87-.
- , —, —. *Brezina*, A. A. Pa. C. 128 (1866) 446-.
- , polarising apparatus for. *Thompson*, S. P. Mcr. S. J. (1889) 617-.
- Photometer and polarimeter, new. *Wild*, H. Pogg. A. 99 (1856) 235-; Bern Mt. (1859) 24-; Sch. Gs. Vh. 46 (1862) 107-.
- , polarisation-, for technical purposes, examination of Wenham gas lamps. *Wild*, H. [1887] St. Pet. Ac. Sc. Mm. (*Ra.*) 63 (1890) (*App.* No. 1) 31 pp.; St. Pét. Ac. Sc. Bll. 32 (1888) 193-.
- , —, — — —, simplification. *Wild*, H. [1888] St. Pét. Ac. Sc. Bll. 33 (1890) 5-.
- Plate, Bravais, use. *Cotton*, A. A. C. 8 (1896) 433-.
- Plates, amethyst, use. *Brewster*, (Sir) D. B. A. Rp. (1858) (*pt.* 2) 18.
- , quartz, method of determining whether inclined to optic axis or not. *Soleil*, H. C. R. 41 (1855) 669-.
- , —, — — — — — — — — — (Soleil). *Senarmont*, H. de. A. C. 46 (1856) 89-.
- , —, polished, method of testing. *Dongier*, R. Par. S. Ps. Sé. (1898) 104-.
- , —, testing parallelism. *Brunhes*, B. Par. S. Ps. Sé. (1893) 206-.

## POLARIMETERS.

- Brewster*, (Sir) D. [1841-42] B. S. P. 4 (1841) 306-; Ir. Ac. T. 19 (1843) 377-.
- Righi*, A. Bologna Ac. Sc. Mm. 6 (1884) 599-.
- Damien*, B. C. Bll. Sc. Nord 16 (1884-85) 169-.
- Pickering*, E. C. Am. Ac. P. 21 (1886) 294-.
- Frič*, Jo. Z. Zuckin. Böhm. 17 (1892-98) 7-.
- comparability of measurements. *Lippich*, F. Z. Instk. 12 (1892) 333-.

4000 *Polarimeters*

- comparison of forms. *Damien, B. C.* (xii) *Bll. Sc. Nord* 15 (1883) 221-.
- cover glasses for, method of examination. *Frič, Jo., & Frič, Ja.* *Z. Zuckin. Böhm.* 16 (1891-92) 307-.
- half-shadow. *Lippich, F.* (xii) *Lotos* 30 (1882) 45-.
- field in, by 2 inclined glass plates. *Poynting, J. H. B. A. Rp.* (1899) 662-.
- , improvement. *Lippich, F.* *Z. Instk.* 14 (1894) 326-, 420.
- , theory. *Lippich, F.* *Wien Ak. Sb.* 99 (1891) (*Ab. 2a*) 695-.
- , use of photography with. *Chauvin, —, & Fabre, C. C. B.* 113 (1891) 691-.
- improvements. *Frič, Jo., & Frič, Ja.* *Z. Zuckin. Böhm.* 17 (1892-93) 551-.
- lighting arrangements for. *Martens, F. F.* *Z. Instk.* 18 (1898) 335-.
- for ordinary light. *Laurent, L.* *Par. S. Ps.* 86 (1882) 146-; *C. R.* 94 (1882) 442-.
- photopolarimeter. *Cornu, A.* *As. Fr. C. B.* 11 (1882) 253-.
- for rotatory polarising liquids. *Steeg, —, & Reuter, —.* *Z. Instk.* 8 (1888) 427-.
- scale, apparatus for lighting. *Schneider, H. Z. Zuckin. Böhm.* 14 (1889-90) 219-.
- sodium light replaced by light filter for polarimetric work. *Landolt, H.* *Phm. Z. Russl.* 33 (1894) 773-.
- spectropolarimeter. *Fleischl, E. von.* *Exner Rpm.* 21 (1885) 32-.
- tube. *Hanus, F.* *Z. Zuckin. Böhm.* 18 (1893-94) 14-.
- tubes, porcelain. *Müller, M.* *Z. Angew. C.* (1888) 251-.
- twin prisms for. *Thompson, S. P.* *Ph. Mg.* 24 (1887) 397-.
- vertical. *Schmidt, F., & Hänsch, —.* *Z. Instk.* 5 (1885) 61-.
- yellow light for polarimetric observations. *Dupont, F.* *A. C. Anal.* 2 (1897) 267-.

## POLARISCOPE.

- Brooke, H. J.* *Silliman J.* 15 (1829) 369-.
- Amici, G. B.* *A. C.* 12 (1844) 114-.
- Bryson, A.* *Edinb. N. Ph. J.* 48 (1850) 19-.
- Senarmont, H. de.* *A. C.* 28 (1850) 279-.
- Bravais, A.* [1851] *C. R.* 32 (1851) 112-; *A. C.* 43 (1855) 129-.
- Adams, W. G. L.* *Ps. S. P.* 1 (1876) 152-; *Ph. Mg.* 50 (1875) 13-; *B. A. Rp.* (1878) 486.
- acetylene as illuminant. *Wiley, H. W.* *Am. C. S. J.* 18 (1896) 179-.
- adapted to sky observations. *Bosanquet, R. H. M.* *Ph. Mg.* 2 (1876) 20-.
- analyser. *Airy, G. B.* [1832] *Camb. Ph. S.* T. 4 (1833) 313-.
- and crystalline plate, apparatus to measure planes of polarisation. *Laurent, L.* *Par. S. Ps. Sé.* (1881) 278-.
- , elliptic. *Stokes, G. G.* *B. A. Rp.* (1851) (*pt. 2*) 14-.
- , half-shadow. *Macé de Lépinay, J.* *C. R.* 131 (1900) 832-.
- , rotating. *Mach, E.* *A. Ps. C.* 156 (1875) 169-.

*Prisms* 4000

- Arago's, modification. *Pohl, J. J.* *Dingler* 163 (1862) 433-.
- for demonstration. *Lasaulx, A. C. P. F. von.* *N. Jb. Mn.* (1878) 509-.
- direct reflecting. *Hall, T. P.* *Science* 19 (1892) 323.
- measuring. *Adams, W. G. L.* *Ps. S. P.* 3 (1890) 112-; *Ph. Mg.* 8 (1879) 275-.
- natural. *Silliman, B. (jun.)* *Silliman J.* 47 (1844) 418.
- objects. *Spottiswoode, W.* *Nt.* 15 (1877) 275-.
- pocket, oleomargariscope. *Taylor, T.* *Am. S. Mer. P.* 10 (1888) 159-.
- polariser. *Wheatstone, (Sir)* *C. R. S. P.* 19 (1871) 381-.
- , *Glan, P.* *Carl Rpm.* 16 (1890) 570-; 17 (1881) 195.
- , *Thompson, S. P.* *Nt.* 44 (1891) 455.
- , *Amici.* *Madan, H. G.* *Mer. S. J.* 6 (1886) 682-.
- , half-shadow, tripartite. *Lippich, F.* *Wien Ak. Sb.* 105 (1896) (*Ab. 2a*) 817-.
- , Iceland spar. *Foucault, L.* *C. B.* 45 (1857) 236-.
- in spar of small thickness. *Joubin, —.* *Par. S. Ps. Sé.* (1897) 59\*-.
- polarisers, double refraction. *Dove, H. W.* *Sch. Nf. Gs. Vh.* 48 (1864) 49.
- reflecting and direct acting, for arc light projector. *Knipe, O.* *Science* 22 (1893) 272.
- revolving. *Spottiswoode, W.* *Ph. Mg.* 49 (1875) 472-.
- simple. *Baumgartner, A. von.* *Baumgartner Z.* 1 (1826) 33-.
- table-, Spottiswoode's combination with. *Tisley, S. C.* *B. A. Rp.* (1874) (*Sec.*) 26-.
- Polarised light, compensations. *Brewster, (Sir) D.* [1841-42] *R. S. P.* 4 (1841) 306-; *Ir. Ac. T.* 19 (1845) 877-.
- , demonstration of properties, method. *Umov, N.* *Z. Ps. C.* 30 (1899) 711-; *A. Ps.* 2 (1900) 72-.

## PRISMS.

- analysing. *Jellett, J. H.* *NH. Bv.* 7 (1860) (*P.*) 503-.
- Bertrand's idiocyclophanous spar-prism. *Madan, H. G.* *Nt.* 42 (1890) 52-.
- doubly refracting (as polariser). *Senarmont, H. de.* *A. C.* 50 (1857) 480-.
- , for determination of elliptic axes. *Jannettaz, E.* *C. R.* 78 (1874) 413-.
- Polarising Prisms.*
- Dove, H. W.* *Berl. Mb.* (1864) 42.
- Hartnack, —, & Przymowski, —.* *Carl Rpm.* 1 (1866) 325-; 2 (1867) 217-.
- (*Hartnack & Przymowski's.*) *Deleuil, —.* *C. R.* 62 (1866) 149-.
- Jamin, J.* *C. R.* 68 (1869) 221.
- Thompson, S. P.* *Ph. Mg.* 12 (1881) 349-.
- Glazebrook, R. T.* *L. Ps. S. P.* 5 (1894) 204-.
- Ph. Mg.* 15 (1883) 352-.
- Ahrens, C. D.* *Mer. S. J.* 4 (1884) 533-.
- Feussner, K.* *Z. Instk.* 4 (1884) 41-.

## 4000 Polarisation

- (Ahrens's.) *Thompson, S. P. B. A. Bp.* (1885) 912.  
*Ahrens, C. D. Mer. S. J. 6* (1886) 897-, 859.  
 (Ahrens's.) *Schröder, H. Z. Instk. 6* (1886) 810-.  
*Thompson, S. P. Ph. Mg. 21* (1886) 476-; *Par. S. Ps. Sé.* (1887) 100-.  
*Grosse, —. D. Nf. Vh.* (1890) (*Th. 2*) 83-.  
 the cutting of. *Thompson, S. P. B. A. Bp.* (1886) 520.  
 Dove's apparatus, modification. *Kayser, E.* [1892] *Danzig Schr. 8* (1892-94) (*Hefte 3 & 4*) xxxiv-.  
 Foucault's and Ahrens's, modification. *Madan, H. G. Nt. 31* (1885) 371-.  
*Nicol, Nicol, W. Edinb. N. Ph. J. 6* (1829) 88-.  
 —. *Talbot, W. H. F. (vi Adds.) Ph. Mg. 4* (1884) 289-.  
 —. *Spassky, M. Pogg. A. 44* (1838) 168-.  
 —. *Nicol, W. Edinb. N. Ph. J. 27* (1839) 332-.  
 —. *Talbot, W. H. F.* [1871] *Edinb. R. S. P. 7* (1872) 468-.  
 —. *Glazebrook, R. T. Ph. Mg. 10* (1880) 247-.  
 —, of calcite and glass. *Leiss, C. Berl. Ak. Sb.* (1897) 901-.  
 —, — — —. *Lommel, E. von.* [1898] *Münch. Ak. Sb. 28* (1899) 111-.  
 —, exact orientation of principal section. *Laurent, L. C. R. 86* (1878) 682-.  
 — and Foucault, manufacture. *Laurent, L. C. R. 102* (1886) 1012-; *Par. S. Ps. Sé.* (1886) 109-.  
 —, improvement. *Radicke, G. Pogg. A. 50* (1840) 25-.  
 —. *Hasert, B. Pogg. A. 113* (1861) 189-.  
 —, large. *Ahrens, C. D.* [1899] *Nt. 61* (1899-1900) 31-.  
 —, modification giving wider angle of field. *Thompson, S. P. B. A. Bp.* (1885) 912.  
 —, principle. *Potter, R. Ph. Mg. 14* (1857) 452-.  
 —, use. *McConnel, J. C. L. Ps. S. P. 7* (1886) 22-; *Ph. Mg. 19* (1885) 817-.  
 —, — in polarisation measurements. *Cornu, A. (ix)* *Par. S. Phlm. Bll. 4* (1867) 5-.  
 silvered, for successive polarisation. *Stephenson, J. W. M. Mer. J. 7* (1872) 246-.  
 sulphur, for infra-red rays. *Uljanin, V. Kazan Un. Mm.* (1899) (*Pts. 7 & 8*) 185-; *Fschr. Ps.* (1899) (*Ab. 2*) 42.  
 with wide field and transverse faces. *Bertrand, E. C. R. 99* (1884) 538-.
- Projection apparatus, Duboscq. *Bertin, A. Par. S. Ps. Sé.* (1874) 62-.  
 — for examination of rock slices by polarised light. *Pellin, P. As. Fr. C. R.* (1897) (*Pt. 1*) 197-.  
 —, Soleil's, modification. *Lovering, J. Am. As. P.* (1853) 24-.  
 —, crystallographic, optical bench for. *Grattarola, G. Rv. Sc. Ind. 29* (1897) 1-.
- Refractive indices, determination by angle of polarisation. *Pfaff, (Dr.) F. A. Ps. C. 127* (1866) 150-.

## Saccharometers 4000

- Refractive indices, determination by angle of polarisation (Pfaff). *Des Cloizeaux, A. A. Ps. C. 129* (1866) 479-.  
 Refractor, differential, for polarised light. *Jamin, J. C. R. 67* (1868) 814-.  
 Resultant vibrations in polarised light, instrument to illustrate. *Snell, E. S. Silliman J. 32* (1861) 376-.  
 Rotatory polarisation experiments, apparatus for measuring deviations. *Soleil, —. C. R. 21* (\*1845) 426-.  
 — — —, — — —, Soleil's. *Biot, J. B. C. R. 21* (1845) 428-.  
 — — —, method of facilitating. *Soleil, —. C. R. 20* (1845) 1905-.  
 — — in liquids, apparatus. *Powell, B. Ph. Mg. 22* (1843) 241-.  
 — power, apparatus for measuring. *Cornu, A. Par. Bll. S. C. 14* (1870) 140-.  
 — — — and methods for measuring. *Biot, J. B. C. R. 20* (1845) 1747-.  
 — — of liquids, apparatus for observing. *Biot, J. B. C. R. 11* (1840) 413-.  
 — — — quartz, apparatus and method for measuring. *Broch, O. J. A. C. 34* (1852) 119-.

## SACCHAROMETERS.

- Soleil, —. C. R. 24* (1847) 973-.  
*Hendry, W. J. Mer. Soc. 8* (1860) 248-.  
*Jellet, J. H.* [1863] *Ir. Ac. P. 8* (1864) 279-.  
*Laurent, L. Par. S. Ps. Sé.* (1874) 7-.  
*Trannin, H. As. Fr. C. B.* (1885) (*Pt. 1*) 105.  
 analyser and measuring arrangement for. *Martens, F. F. Z. Instk. 20* (1900) 82-.  
 compensator for. *Duboscq, J., & Soleil, N. C. R. 31* (1850) 248-.  
 fringe, for white light. *Duboscq, T., & Duboscq, A. Par. S. Ps. Sé.* (1886) 64-.  
*Laurent, Laurent, L. C. R. 69* (1879) 665-.  
 — white-light. *Dufet, H. J. de Ps. 1* (1882) 552-.  
 and means of rendering sodium flame absolutely monochromatic. *Laurent, L. C. R. 78* (1874) 349-.  
 Mitscherlich's. *Schwippel, C. Brünn Vh. 2* (1863) 72-.  
 modification. *Prazmowski, A. C. R. 76* (1878) 1212-.  
 or polarimeter, measurement of electric current. *Arsenal, — d'. Par. S. Ps. Sé.* (1890) 108-.  
 polaristrobometer. *Wild, H. I.* [1864-69] *Bern Mt.* (1864) 27-; *St. Pet. Ac. Sc. Mm. (Rs.) 16* (\*1870) 141-; *St. Pét. Ac. Sc. Bll. 14* (1870) 149-.  
 —, improvements. *Wild, H. Zür. Vjschr. 43* (1898) 57-; *Arch. Sc. Ps. Nt. 6* (1898) 879-.  
 — and rotating Nicol, theory. *Sande-Bakhuyzen, H. G. van de.* [1871] *A. Ps. C. 145* (1872) 259-.  
 — with white light. *Wild, H. I. St. Pét. Ac. Sc. Bll. 28* (1863) 407-.  
 — — —; absolute measurements by polaristrobometer. *Wild, H. Zür. Vjschr. 44* (1899) 186-.

- polaristrobometric methods. *Lippich, F.* Wien Ak. Sb. 85 (1882) (*Ab. 2*) 268-.
- , half-shadow apparatus. *Lippich, F.* Wien Ak. Sb. 91 (1885) (*Ab. 2*) 1059-.
- for projection on screen. *Laurent, L. C. R.* 105 (1887) 409-; *Par. S. Ps. Sé.* (1887) 97-.
- simple. *Poynting, J. H.* L. Ps. S. P. 4 (1881) 17-; *Ph. Mg.* 10 (1880) 18-.
- Soleil's, degree of accuracy. *Boltshauser, G. A.* Catania At. Ac. Gioen. 8 (1878) 203-.
- spectrosaccharometer. *Glan, P.* Münch. Ak. Sb. 20 (1891) 513-.
- testing quartz plates for. *Herzfeld, A.* Z. Vr. D. Zuckin. 50 (1900) (*Th. 2*) 826-.
- Utzmann's. *Anon.* Mer. S. J. 6 (1886) 687-.
- Spectroscopic and polarising apparatus, combination. *Lang, V. (Ritter) von.* (xii) Z. Kr. 2 (1878) 492-.
- Stauroscope. *Kobell, F. von.* Münch. Gelehrte Az. 40 (1855) (*Bll., No. 18-19*) 145-; 42 (1856) (*Bll., No. 9-10*) 78-; (*vi Adds.*) D. Nf. Vsm. B. 34 (1858) 63-.
- , von Kobell's. *Haidinger, W.* Wien Sb. 15 (1855) 351-.
- , —, modification. *Brezina, A.* A. Ps. C. 128 (1866) 446-.
- , —, — (Brezina). *Kobell, F. von.* A. Ps. C. 129 (1866) 478-.
- and stauroscopic methods. *Laspeyres, E. A. H.* (xii) Z. Instk. 2 (1882) 14-, 54-.
- , use. *Brezina, A.* A. Ps. C. 130 (1867) 141-.
- Stauroscopic anomalies. *Laspeyres, E. A. H.* (xii) Z. Kr. 6 (1882) 438-.
- measurements. *Sauber, W.* Lieb. A. 124 (1862) 83-.
- observations. *Kobell, F. von.* Münch. Gelehrte Az. 41 (1855) (*Bll., No. 7-10*) 60-; 43 (1856) (*Bll., No. 1-5*) 1-; 46 (1858) 254-.
- , von Kobell's. *Rood, O. N.* Silliman J. 27 (1859) 388-.
- and other optical experiments. *Rood, O. N.* Silliman J. 27 (1859) 391-.
- Strobomicrometer for path difference between polarised rays. *Zenker, W.* Z. Instk. 5 (1885) 1-.
- Tourmaline pincette. *Bertin, A.* Par. S. Ps. Sé. (1880) 104-.
- Wave-apparatus, for Fresnel's polarised light theory. *Woodward, C. J.* L. Ps. S. P. 4 (1881) 323-; *Ph. Mg.* 12 (1881) 145-.
- Working Iceland spar and quartz, method. *Laurent, —.* Par. S. Ps. Sé. (1887) 177-.
- Non-polarised light, constitution. *Stefan, J.* [1864] Wien Sb. 50 (1865) (*Ab. 2*) 360-.
- , — (Stefan). *Verdet, É.* Les Mondes 8 (1865) 252-.

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- Caoutchouc, compressed. *Lehmann, O.* Z. Kr. 12 (1887) 388.
- Cherry gum. *Ambross, H.* D. Bt. Gs. B. 7 (1889) 103-.
- Crystals. *Biot, J. B.* Par. Mm. de l'I. (1812) 1-, (*Pte. 2*) 19-, 31-; *Par. S. Phlm. Bll.* (1814) 178-.
- , twin. *Grailich, W. J.* Wien SB. 11 (1854) 817-; 12 (1854) 280-.
- Diamond, sodium chloride and calcium fluoride (certain specimens). *Brewster, (Sir) D.* [1815] Edinb. R. S. T. 8 (1818) 157-.
- , structure and properties. *Brewster, (Sir) D.* Edinb. Ph. J. 3 (1820) 98-.
- Gutta percha, stretched. *Zimmermann, A. D.* Bt. Gs. B. 9 (1891) 81-.
- Peristome of mosses. *Amann, J.* [1886] Laus. S. Vd. Bll. 22 (1887) 157-.
- Quartz. *Dove, H. W.* Berl. B. (1887) 77-.
- , *Spottiswoode, W.* [1878] B. I. P. 8 (1879) 561-.
- threads, production, and behaviour of melted quartz to polarised light. *Julius, V. A.* Mbl. Nt. (1893-94) 98-.
- Silk, birefringence. *Panbianco, R.* Rv. Mn. Cr. 15 (1895) 57-.
- Starch. *Biot, J. B.* C. R. 18 (1844) 795-.
- , *Baily, W.* Ph. Mg. 2 (1876) 123-.
- and unannealed glass under polariscope. *Baily, W.* [1878] L. Ps. S. P. 3 (1880) 1-; *Ph. Mg.* 7 (1879) 39-.
- Uncrystallised films. *Brewster, (Sir) D.* Edinb. R. S. T. 22 (1861) 607-.
- Phenomena. *Nobili, L.* Bb. Un. 45 (1880) 289-.
- , *Marx, C. M.* Schweigger J. 62 (=Jb. 2) (1831) 235-.
- , *Fizeau, H. L.* C. R. 52 (1861) 267-, 1221-.
- , *Filachou, (l'abbé) —.* Fr. g. Sc. 35 (1872) 182-.
- Polarisation applied to photography. *Acres, B.* Phot. J. 18 (1894) 208-.
- , causes. *Biot, J. B.* Par. S. Phlm. Bll. (1816) 161-.
- , connection of chemical forces with. *Maske-lyne, N. S.* [1851] B. I. P. 1 (1851-54) 45-.
- of groups of luminous or calorific rays, and their origin and variety. *Issaly, (l'abbé) —.* Bordeaux S. Sc. Mm. 5 (1895) 437-.
- — light of comets and corona of eclipses. *Liais, E.* C. R. 48 (1859) 950-.
- — — emitted by incandescent solid and liquid surfaces. *Millikan, R. A.* N. Y. Ac. T. 14 (1895) 155-.
- at margins of lenses. *Rinne, F.* Cb. Mn. (1900) 88-.
- , plane, circular and elliptic. *Flesch, J.* Grunert Arch. 4 (1844) 1-.
- — of diffracted light, position, theory. *Glazebrook, R. T.* Camb. Ph. S. P. 5 (1886) 254-.

## 4000 Polarised Light

- Polarisation plane, significance. *Ångström*,  
*A. J.* Stockh. Öfv. 10 (1858) 125-.  
 —, use of bi-quartz in determination. *Ward*,  
*A. W.* L. Ps. S. P. 10 (1890) 171-; Ph. Mg.  
 28 (1889) 184-.  
 — and wave-length for different colours.  
*Boltzmann*, *L.* (vii) Pogg. A. (*Jubelbd.*)  
 (1874) 128-.

### POLARISED LIGHT.

- Ditscheiner*, *L.* [1867] Wien Schr. 7 (1868)  
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*Fizeau*, *C.* [1890] Ciel et Terre 1 (\*1881)  
 104-.  
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 (1862) 209-.  
 —. *Potier*, *A.* C. R. 64 (1867) 960-.  
 —. *Quincke*, *G.* A. Ps. C. 149 (1873) 278-;  
 47 (1892) 765-.  
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 Vr. Jbr. (1899-1900) 78-.  
 — suggested to find whether polarised light  
 acts on magnetic field. *Schantjes*, *H.* Brux.  
 Ac. Bil. 19 (1890) 444-; 20 (1890) 224-.  
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 R. 69 (1869) 189-.  
 — opaque bodies by. *Lallemand*, *A. C. R.*  
 78 (1874) 1272-.  
 — transparent bodies by. *Lallemand*, *A.*  
 C. R. 69 (1869) 917-.  
 influence of water, 0° to 4° C. *Biot*, *J. B. C.*  
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 (*Dr.*) —. Dresden Sb. Nt. Heilk. (1868-69)  
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 and non-polarised light, is glass surface more  
 heated by former than by latter? *Erman*,  
*P.* (vi *Adds.*) Berl. Ab. (1818-19) (*Ps.*)  
 404-.  
 in optical telegraphy, use. *Ellie*, *R.* Bordeaux  
 S. Sc. Mm. 4 (1888) 359-; 5 (1890) xci-.  
 plane, reflection, amplitude and phase. *Grai-  
 lich*, *W. J.* Wien SB. 21 (1856) 427-.  
 —, —, —. *Beer*, *A.* (vii) Wien Sb. 21  
 (1856) 428-.  
 —, refraction by glass, effect of moisture.  
*Glazebrook*, *R. T.* [1884] Camb. Ph. S. P. 5  
 (1886) 169-.  
 —, — at surface of uniaxial crystal. *Glaze-  
 brook*, *R. T.* [1881-82] Phil. Trans. 173  
 (1883) 595-; R. S. P. 34 (1883) 393-.  
 rapidly rotating, phenomena. *Dove*, *H. W.*  
 Berl. B. (1847) 70-.  
 reflection. *Cauchy*, *A. L. C. R.* 31 (1850)  
 766.  
 — (geometrical researches). *Cornu*, *A.* (ix)  
 Par. S. Phlm. Bil. 2 (1865) 33-, 49-, 55-.  
 —. *Croullebois*, *M.* C. R. 84 (1877) 604-.  
 —, laws. *Shebuev*, *G. N.* (xii) Kazan Un.  
 Mm. (1879) (*Pt.* 1) 83-.  
 — and refraction. *Jellett*, *J. H.* Ir. Ac. P. 7  
 (1858) 116-.  
 — —. *Cornu*, *A.* B. A. Bp. 86 (1866)  
 (*Sept.*) 9-.  
 — —, theory, Fresnel's. *Rossi*, *S.* Rm.  
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## Plane of Vibration 4000

- reflection and refraction, theory, mathematical.  
*Gruzintsev*, *A. P.* (xii) Kharkov Mth. S.  
 Com. (1880) 81-; Fachr. Ps. (1884) (*Ab.* 2)  
 85.  
 streams from different sources, composition and  
 resolution. *Stokes*, *G. G.* [1852] Camb.  
 Ph. S. T. 9 (1856) 399-.

- Polarising properties of groups of rays of any  
 kind. *Issaly*, (*l'abbé*) —. Bordeaux S. Sc.  
 Mm. 1 (1896) 361-; 3 (1899) 1-.  
 Refraction and reflection at twin surfaces.  
*Graulich*, *W. J.* Wien D. 9 (1855) 57-;  
 Wien SB. 15 (1855) 311-; 19 (1856) 226-;  
 Wien D. 11 (1856) (*Ab.* 2) 41-.  
 Theory. *Fresnel*, *A. J.* Par. S. Phlm. Bil.  
 (1824) 147-.  
 —. *Challis*, *J.* [1846] Camb. Ph. S. T. 8  
 (1849) 371-.  
 —. *Billet*, [*F.*] Dijon Ac. Mm. 1 (1851) 73-.  
 —. *Plana*, *G.* (viii) Tor. Mm. Ac. 18 (1859)  
 lxii.  
 —. *Külp*, *L.* Arch. Mth. Ps. 48 (1868) 78-.  
 —, mathematical. *Laurent*, *P. A.* C. R. 19  
 (1844) 329-.  
 —, —. *Issaly*, (*l'abbé*) —. Bordeaux S. Sc.  
 Mm. 4 (1894) 165-.  
 —, mechanical. *MacCullagh*, *J.* [1841] Ir.  
 Ac. P. 2 (1840-44) 139-.

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- Babinet*, *J.* C. R. 29 (1849) 514-.  
*Haidinger*, *W.* Wien SB. 6 (1852) 52-.  
 (Stokes.) *Haidinger*, *W.* Wien SB. 12 (1854)  
 685-.  
*Stokes*, *G. G.* Wien SB. 12 (1854) 686-.  
 [*Beer*, *A.* non] *Haidinger*, *W.* Wien SB. 15  
 (1855) 6-.  
*Holtzmann*, *C. H. A.* Pogg. A. 99 (1856) 446-.  
*Moigno*, *F.* B. A. Rp. (1857) (*pt.* 2) 9-.  
*Challis*, *J.* Ph. Mg. 17 (1859) 102-.  
*Bartlett*, *W. H. C.* Silliman J. 30 (1860)  
 361-.  
*Lorenz*, *L.* Sk. Nt. F. 8 (1860) 473-.  
*Briot*, *C.* C. R. 52 (1861) 393-.  
*Quincke*, *G.* Berl. Mb. (1862) 714-.  
*Landur*, *N.* Presse Sc. 1 (1863) 418-.  
*Mascart*, *É.* C. R. 63 (1866) 1005-.  
*Ketteler*, *E.* A. Ps. C. 1 (1877) 206-, 556-.  
*Réthy*, *M.* [1880] (xii) Mag. Tud. Ak. Étk.  
 (*Mth.*) 7 (1881) (*No.* 16) 17 pp.  
*Geigel*, *R.* Würzb. Ps. Md. Vh. 23 (1890)  
 (29)-.  
*Wiener*, *O.* A. Ps. C. 40 (1890) 203-, 744.  
 (Wiener's experiment.) *Drude*, *P.* A. Ps. C.  
 41 (1890) 154-; 48 (1893) 119-.  
 (—) *Cornu*, *A.* C. R. 112 (1891) 186-.  
 (—) *Poincaré*, *H.* C. R. 112 (1891) 325-.  
 (—) (Poincaré.) *Berthelot*, —. C. R. 112  
 (1891) 329-.  
 (—) (—) *Cornu*, *A.* C. R. 112 (1891)  
 365-.  
 (—) (—) *Potier*, *A.* C. R. 112 (1891)  
 383-.

## 4005 Polarisation

- Carvalho, E.* C. R. 112 (1891) 481-.
- Drude, P.* A. Ps. C. 43 (1891) 177-.
- (Wiener's experiment.) *Gilbert, P.* Rv. Quest. Sc. 30 (1891) 225-, 558-.
- Lommel, E.* [1891] Münch. Ak. Sb. 21 (1892) 181-.
- (Wiener's experiment.) *Potier, A.* J. de Ps. 10 (1891) 101-.
- connection with diffraction. *Eisenlohr, F.* Pogg. A. 104 (1858) 337-.
- — — — — *Stokes, G. G.* Ph. Mg. 18 (1859) 426-.
- determination by diffraction. *Lorenz, L.* Pogg. A. 111 (1860) 315-.
- — — — — *Gilbert, P.* C. R. 64 (1867) 161-.
- — — — — dispersion in doubly refracting crystals. *Carvalho, E.* Par. S. Ps. Sé. (1890) 76-.
- — — — — reflection and refraction. *Lorenz, W.* Pogg. A. 114 (1861) 238-.
- in doubly refracting crystals. *Ebner, V. von.* Z. Ws. Mkr. 9 (1892) 289-.
- 2 hypotheses, probability. *Haidinger, W.* [1854] Wien SB. 15 (1855) 86-.
- Vibrations of light, theory. *Biot, J. B.* Par. Mm. de l'I. (1812) (pte. 2) 1-.
- in non-polarised and partially polarised light, nature. *Lippich, F.* Wien SB. 48 (1863) (Ab. 2) 146-.
- of plane polarised light. *Rankine, W. J. M.* Ph. Mg. 1 (1851) 441-.
- — — — — at right angles to plane of polarisation. *Cauchy, A. L.* C. R. 29 (1849) 645.
- , transverse, of crystalline disk. *Sundberg, E.* Stockh. Öfv. (1885) (No. 5) 77-; Föchr. Mth. (1885) 965.
- , —, — light. *Wright, L.* Nt. 21 (1880) 370.
- Wave surface, Fresnel's, Hamilton's singular points on. *Booth, W.* [1896] Dubl. S. So. P. 8 (1893-98) 381-.
- — — — — optical properties. *Mannheim, A. C.* R. 81 (1875) 369-; As. Fr. C. R. (1875) 231-; C. R. 82 (1876) 368-; 122 (1896) 708-.
- theory applied to polarisation. *Osann, G.* [1857] Würzb. Vh. 8 (1858) 153-.
- Waves, plane, propagation in incompressible medium, and double refraction. *Kohl, E.* Mh. Mth. Ps. 10 (1899) 343-.
- , —, — — system of molecules. *Cauchy, A. L.* C. R. 7 (1838) 865-.

## 4005 Elliptic and Circular Polarisation. General.

### CIRCULAR POLARISATION.

- Dove, H. W.* Pogg. A. 35 (1835) 579-.
- Brezina, A.* Wien Sb. 60 (1870) 891-.
- of amethyst. *Brewster, (Sir) D.* [1819] Edinb. R. S. T. 9 (1823) 139-.
- cinnabar. *Descloiseaux, A.* C. R. 44 (1857) 876-, 909-.
- circular polarisers, determination of sense of circular vibration. *Cotton, A.* J. de Ps. 7 (1898) 81-.

## Elliptic and Circular 4005

- circularly polarised light, interference fringes with. *Billet, [F.]* Dijon Ac. Mm. 2 (1852-53) (pte. 2) 147-.
- — — — — phenomena, and new apparatus. *Soleil, H.* C. R. 40 (1855) 1058-.
- — — — — (Soleil). [*Bertin, A.* non] *Nörremberg, —.* A. C. 20 (1870) 214-.
- — ray of light, production of magnetic field by. *Righi, A.* Rm. R. Ac. Linc. Rd. 8 (1899) (Sem. 1) 325-.
- polarising media, reflection from. *Voigt, W.* A. Ps. C. 30 (1887) 190-.
- — — — — and refraction at boundary. *Voigt, W.* A. Ps. C. 21 (1884) 522-, 712.
- — — — — theory. *Clebsch, A.* Crelle J. 57 (1860) 319-.
- and double refraction, joint effect. *Wiener, O.* A. Ps. C. 35 (1898) 1-.
- of heat by reflection. *Forbes, J. D.* Ph. Mg. 8 (1836) 246-.
- production by mica plates. *Pfaff, I. B. A. F.* Münch. Ak. Sb. 6 (1876) 211-.
- related to symmetry of homogeneous structures. *Barlow, W.* Ph. Mg. 43 (1897) 110-.
- of sodium chlorate. *Marbach, H.* Bresl. Schl. Gs. Übs. (1854) 17-; Pogg. A. 91 (1854) 482-.

- Circularly and elliptically polarised light, distinction of positive and negative uniaxial crystals in. *Dove, H. W.* Pogg. A. 40 (1837) 457-, 482-.
- — — — — polarising media, theory. *Ketteler, E.* A. Ps. C. 16 (1882) 86-.
- Elliptic and circular and plane polarisation. *Flesch, J.* Grunert Arch. 4 (1844) 1-.
- — — — — polarisation in crystals. *Krejčí, J.* Prag Sb. (1887) (Mth.-Nt.) 401-.

### ELLIPTIC POLARISATION.

- Powell, B.* [1833-44] Ashmol. S. P. 1 (1844) No. 2, 3-; B. A. Rp. (1842) (pt. 2) 13; Ashmol. S. P. 2 (1854) No. 21, 47-, 98-; B. A. Rp. (1844) (pt. 2) 7-.
- Dale, J.* B. A. Rp. (1846) (pt. 2) 5.
- Mouton, L.* Par. S. Ps. Sé. (1875) 82-.
- Sissingh, R.* Arch. Néerl. 20 (1886) 171-.
- cause. *Tovey, J.* Ph. Mg. 12 (1838) 10-.
- connection of wave theory with. *Powell, B.* B. A. Rp. (1839) (pt. 2) 2-.
- determination of axes. *Hecht, B.* A. Ps. C. 20 (1883) 426-.
- ellipsoid of polarisation relative to electromagnetic waves in selenite, and elliptic polarisation of waves. *Righi, A.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 1) 207-.
- elliptic rays, analysis. *Croullebois, M.* C. R. 79 (1874) 470-.
- — — — — interference. *Croullebois, M.* C. R. 77 (1873) 1269-; A. C. 4 (1875) 406-.
- vibrations in rotatory, doubly refracting medium. *Lefebvre, P.* J. de Ps. 1 (1892) 121-.
- geometrical representation. *Lafay, A.* J. de Ps. 4 (1895) 178-.

## 4005 Polarisation

- of heat, by reflection from metals. *Knoblauch, C. H.* D. Nt. B. (\*1877) 117; A. Ps. C. 10 (1880) 354-; Halle Nf. Gs. Festschr. (1879) 329-; A. Ps. C. 19 (1883) 352-; Ac. Nt. C. N. Acta 50 (1887) 485-.
- — — total reflection. *Knoblauch, H.* Ac. Nt. C. N. Acta 55 (1891) 281-.
- intensity of light when vibration is elliptical. *MacCullagh, J.* Edinb. J. Sc. 5 (1831) 86-.
- measurement of elements. *Meslin, G. J. de* Ps. 9 (1890) 436-.
- — — (Meslin). *Bouasse, —.* J. de Ps. 10 (1891) 61-.
- in quartz. *Tovey, J.* Ph. Mg. 14 (1889) 169-, 321-.
- — — *Hecht, B.* A. Ps. C. 30 (1887) 274-.
- by reflection. *Powell, B.* Phil. Trans. (1843) 35-; Pogg. A. 72 (Ergänz.) (1843) 285-.
- — — (total). *Quincke, G.* A. Ps. C. 127 (1866) 199-.
- — — (ordinary). *Quincke, G.* A. Ps. C. 128 (1866) 355-.
- — — *König, W.* A. Ps. C. 17 (1882) 1016-.
- — — from calcite. *Schmidt, K. E. F.* A. Ps. C. 37 (1889) 353-; 38 (1889) 876.
- — — at crystalline surfaces. *Schenck, E.* A. Ps. C. 15 (1882) 177-.
- — — from metals. *Biot, J. B.* A. C. 94 (1815) 209-.
- — — *Brewster, (Sir) D.* Phil. Trans. (1830) 287-.
- — — *Neumann, F. E.* Pogg. A. 26 (1832) 89-.
- — — *Jamin, J.* C. B. 21 (1845) 430-.
- — — *Powell, B.* Phil. Trans. (1845) 269-.
- — — *Jamin, J.* C. B. 22 (1846) 477-; 23 (1846) 1103-.
- — — *Quincke, G.* A. Ps. C. 128 (1866) 541-.
- — — (polarisation of visible and ultra-violet rays). *Cornu, A.* C. R. 108 (1889) 917-, 1211-.
- — — dependent on thickness of metal. *Quincke, G.* A. Ps. C. 129 (1866) 207-.

### REFLECTION AT TRANSPARENT MEDIA, ELLIPTIC POLARISATION BY.

- Potier, A.* C. B. 75 (1872) 617-.
- (Potier.) *Quincke, G.* A. Ps. C. 148 (1873) 311-; 149 (1873) 571-.
- (Quincke.) *Potier, A.* A. Ps. C. 148 (1873) 650-.
- Cornu, A.* C. B. 86 (1876) 649-.
- Ryn van Alkemade, A. C. van.* A. Ps. C. 20 (1883) 22-.
- Wernicke, W.* A. Ps. C. 30 (1887) 452-.
- (Wernicke.) *Voigt, W.* A. Ps. C. 31 (1887) 326-.
- (Voigt.) *Wernicke, W.* A. Ps. C. 31 (1887) 1028-.
- (Wernicke.) *Voigt, W.* A. Ps. C. 32 (1887) 526-.
- Potier, A.* C. B. 108 (1889) 599-.
- (Polarisation of visible and ultra-violet rays.) *Cornu, A.* C. B. 108 (1889) 917-, 1211-.

## Production of Polarised Radiation 4010

- Schmidt, K. E. F.* Berl. Ak. Sb. (1893) 1041-; A. Ps. C. 51 (1894) 417-; 52 (1894) 75-.
- Drude, P.* A. Ps. C. 53 (1894) 69-.
- (Drude.) *Schmidt, K. E. F.* A. Ps. C. 53 (1894) 769-.
- (Schmidt.) *Drude, P.* A. Ps. C. 54 (1895) 191-.
- at incidence near polarising angle. *Mathieu, É. L.* Liouv. J. Mth. 7 (1881) 219-.

- by refraction through metal. *Rollmann, W.* Pogg. A. 90 (1853) 188-.
- relation to surface colour. *Wiedemann, E.* Leip. B. 24 (1872) 263-.
- — — experiments. *Merkel, J.* A. Ps. C. 19 (1888) 1-.
- theory. *Challis, J.* Ph. Mg. 17 (1859) 285-.
- by transmission through, and reflection from, metallic films. *Meslin, —.* A. C. 20 (1890) 56-.
- — — transparent metallic films. *Meslin, G.* C. R. 106 (1888) 197-.

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- Beam of light compounded of 4 polarised beams. *Almeida, C. A. M. de.* [1877] Lisb. J. Sc. Mth. 6 (1878) 34-.
- Experiments, optical. *Merz, L.* Pogg. A. 63 (1844) 49-.
- Lamellar polarisation. *Biot, J. B.* C. R. 12 (1841) 967-; 13 (1841) 391-; Par. Ac. Sc. Mm. 18 (1842) 539-.
- — — so-called, of alum. *Reusch, E.* Berl. Mb. (1867) 424-.
- Pile of plates, intensity of light reflected from or transmitted through. *Stokes, G. G.* R. S. P. 11 (1860-62) 545-.
- — — (glass), intensity of light transmitted. *Erhard, T.* A. Ps. C. 12 (1881) 655-.
- Plates, thin, light reflected and transmitted by. *Lloyd, H.* [1859] (sum) Ir. Ac. T. 24 (1871) 3-.
- Polarisation of chemical rays of light by double refraction, reflection, and repeated single refraction. *Sutherland, J.* Ph. Mg. 19 (1841) 52-.
- — — convergent light. *Quevedo, G.* Mon. Sc. 2 (1888) 225-.
- — — by crystals. *Biot, J. B.* C. R. 13 (1841) 155-.
- — — diffraction. *Erner, K.* Wien. Ak. Sb. 99 (1891) (Ab. 2a) 761-; 101 (1892) (Ab. 2a) 190-; A. Ps. C. 49 (1893) 387-.
- — — *Poincaré, H.* Acta Mth. 16 (189-93) 297-; 20 (1897) 313-.
- — — emission. *Violle, J.* C. R. 105 (1887) 111-; Par. S. Ps. Sé. (1888) 18-.

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- Bérard, J. É.* A. C. 85 (1813) 309-.
- (alleged.) *Powell, B.* Edinb. J. Sc. 3 (1830) 297-; 5 (1831) 206-.
- Forbes, J. D.* Ph. Mg. 7 (1835) 349-; C. R. 2 (1836) 156; 6 (1838) 705-.

- Melloni, M.* C. R. 3 (1836) 133-; A. C. 61 (1836) 375-; 65 (1837) 5-; C. R. 5 (1837) 530-.
- Forbes, J. D.* [1838] Edinb. R. S. T. 14 (1840) 176-.
- (Forbes and Melloni.) *Melloni, M.* A. C. 68 (1838) 107-.
- Desains, P., & La Provostaye, F. de.* C. R. 29 (1849) 121-; A. C. 27 (1849) 109-; C. R. 29 (1849) 757-; 33 (1851) 444-; A. C. 34 (1852) 192-.
- (and its passage through parallel plates.) *Mag-nus, G.* Berl. Mb. (1866) 62-; (1868) 158-, 249-.
- Tyndall, J.* Ph. Mg. 39 (1870) 280-.
- Foster, G. C.* L. Ps. S. P. 2 (1879) 143-; Ph. Mg. 3 (1877) 261-.
- by double refraction. *Knoblauch, H.* Pogg. A. 74 (1849) 177-.
- progressive rotation. *Biot, J. B., & Melloni,* C. R. 2 (1836) 194-.
- reflection. *Knoblauch, H.* Pogg. A. 74 (1849) 161-.
- refraction. *Forbes, J. D.* [1835] Edinb. R. S. T. 13 (1836) 131-, 446-.
- *Melloni, M.* C. R. 2 (1836) 140-.
- simple refraction. *Knoblauch, H.* Pogg. A. 74 (1849) 170-.
- *Desains, P., & La Provostaye, F. de.* C. R. 31 (1850) 19-; A. C. 30 (1850) 159-.
- tourmaline. *Melloni, M.* C. R. 2 (1836) 95-; (vi *Adds.*) Bb. Un. 60 (1835) 367-.
- wire gratings. *Du Bois, H. E. J. G., & Rubens, H.* Berl. Ak. Sb. (1892) 1129-; A. Ps. C. 49 (1893) 593-.

- Polarisation by living animals. *Goddard, J. F.* (vi *Adds.*) Ph. Mg. 15 (1839) 152-.
- oblique transmission. *Brewster, (Sir) D.* Phil. Trans. (1814) 219-.
- of obliquely emitted rays. *Ulanin, W. von.* Berl. Ps. Gs. Vh. (1895) 40-.
- — — — —, and Lambert's law. *Ulanin, W. von.* A. Ps. C. 62 (1897) 528-.
- — — — —, *Kolděček, F.* A. Ps. C. 64 (1898) 398-, 812.
- — — — —, *Ulanin, V.* Kazan Un. Mm. (1899) (*Pts.* 7 & 8) 185-; *Fschr.* Ps. (1899) (*Ab.* 2) 42.

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- American oil of turpentin. *Mahla, F.* Silliman J. 32 (1861) 107-.
- Aragonite. *Dove, H. W.* Pogg. A. 114 (1861) 169-.
- Glacier ice. *Müller, Joh.* Sch. Nf. Gs. Vh. 55 (1872) 258-; A. Ps. C. 147 (1872) 624-.
- Iodine crystals. *Conroy, (Sir) J.* [1876] R. S. P. 25 (1877) 51-.
- Mica. *Forbes, J. D.* B. A. Rp. (1839) (*pt.* 2) 6-.
- , gypsum, etc. *Kobell, F. von.* Pogg. A. 20 (1830) 342-, 412-.
- Mother-of-pearl. *Brewster, (Sir) D.* Phil. Trans. (1814) 397-.

- Organic substances. *Steeg, W.* Pogg. A. 111 (1860) 511-.
- Quinine sulphato-periodide (herapathite). *Hera-path, W. B.* Ph. Mg. 3 (1852) 161-; 6 (1853) 346-; 7 (1854) 352-.
- — — — —. *Hauers, R.* Z. C. 1 (1865) 481-.
- Tesseral crystals, optical anomalies. *Ben-Saude, A.* Portugal Trab. Gl. Com. 1 (\*1833-87) 15-.
- Tourmaline. *Biot, J. B.* A. C. 94 (1815) 191-.
- *Breithaupt, A.* Gilbert A. 64 (1820) 424-.
- Polarisation by pressure. *Biot, J. B.* A. C. 3 (1816) 386-; Par. S. Phlm. Bill. (1816) 49-.

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- Malus, É. L.* Par. Mm. de l'I. (1810) (*pte.* 2) 105-; Gilbert A. 37 (1811) 109-.
- (Transparent bodies.) *Brewster, (Sir) D.* Phil. Trans. (1815) 125-.
- Brewster's law, geometric interpretation. *Grolous, J.* Par. S. Phlm. Bill. 1 (1877) 146-.
- Case. *Quetelet, L. A. J.* Quetelet Cor. Mth. 3 (1827) 30-.
- Experiment. *Brewster, (Sir) D.* Edinb. Ph. J. 7 (1822) 146-.
- Incomplete polarisation at bounding surface of certain media by reflection of simple ray. *Cauchy, A. L.* C. R. 9 (1839) 727-.
- Media in which simple ray may be completely polarised. *Cauchy, A. L.* C. R. 9 (1839) 728-.
- Modifications of polarised light produced by reflection. *Fresnel, A. J.* [1823] Par. S. Phlm. Bill. (1823) 29-; Par. Mm. Ac. Sc. 11 (1832) 393-.
- Partial polarisation, law. *Brewster, (Sir) D.* Phil. Trans. (1830) 69-.
- — — — — (Brewster). *Brandes, H. W.* Kastner Arch. Ntl. 24 (1832) 312-.
- — — — — by total reflection. *Geigel, R.* A. Ps. C. 68 (1899) 698-.
- Polarisation by diffuse reflection. *Govi, G.* C. R. 51 (1860) 360-; Pogg. A. 111 (1860) 349-.
- — — — —. *Soret, J. L.* Arch. Sc. Ps. Nt. 48 (1873) 281-; 50 (1874) 243-; C. R. 78 (1874) 1299-; 79 (1874) 35-.
- — — — — from turbid media. *Hurion, A.* C. R. 114 (1892) 910-; A. C. 7 (1896) 456-.
- reflection at crystal surfaces. *MacCullagh, J.* Ph. Mg. 8 (1836) 103-.
- — — — —. *Seebeck, A.* Pogg. A. 38 (1836) 276-.
- — — — —. *Kelland, P.* [1840] Edinb. R. S. T. 15 (1844) 37-.
- and reflection by crystals, relations. *Biot, J. B.* Par. Mm. de l'I. (1811) 135-.
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- — — — — glass. *Desains, É.* C. R. 31 (1850) 676-; A. C. 31 (1851) 286-.
- — — — — hard rubber. *Bruère, A. H.* Ps. Rv. 6 (1898) 140-.
- — — — — Iceland spar. *Brewster, (Sir) D.* Phil. Trans. (1819) 145-.



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- — — — —. *Gouy, —.* C. B. 98 (1884) 978-.
- — — — —. *Lafay, A.* C. B. 119 (1894) 154-; A. C. 16 (1899) 503-.
- — — — — and white surfaces. *Brewster, (Sir) D. B. A. Rp.* (1844) (pt. 2) 11; Edinb. R. S. T. 23 (1861) 205-.
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- — —, — — —. *Ditscheiner, L.* Wien Ak. Sb. 73 (1876) (Ab. 2) 180-.
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- — —, chromatic polarisation in. *Basso, G.* [1880] Tor. Ac. Sc. Mm. 34 (1883) 3-.
- — —, curves of equal illumination in axial images. *Lommel, E.* Münch. Ak. Sb. 19 (1890) 317-.
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- , interference of polarised light in, and isochromatic curves. *Langberg, C. N.* Mg. Ntvd. 2 (1840) 53-, 103-; Pogg. A. (*Ergänz.*) 51 (1842) 529-.
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- , interference phenomena in. *Ohm, G. S.* Münch. Ab. 7 (1855) 41-, 265-.
- , polarisation colours. *Bertin, —.* A. C. 2 (1884) 485-.
- , projection of monochromatic brushes. *Bertin, A.* Par. S. Ps. Sé. (1883) 43-.
- , twin, interference phenomena. *Pockels, F.* Gött. Nr. (1890) 259-.
- , transmission of polarised light through. *Russell, W. H. L.* Nt. 2 (1870) 299-.
- , tufts and brushes. *Bertrand, É.* J. de Ps. 8 (1879) 227-.
- Glass, appearance of black cross not caused by sudden cooling. *Spittiger, D. C.* Pogg. A. 79 (1850) 297-.
- , compressed, chromatic polarisation by. *Wertheim, G.* C. R. 32 (1851) 289-.
- , —, polarisation in. *Brewster, (Sir) D.* [1816] Edinb. R. S. T. 8 (1818) 353-.
- , cooled, colour figures, and conditions of formation. *Seebeck, T. J.* Schweigger J. 7 (1813) 259-, 382-; 12 (1814) 1-.
- , —, and gypsum, colours, etc. *Rollmann, W.* Halle Z. Nw. 3 (1854) 96-.
- , decomposed, rings of polarised light in specimens. *Brewster, (Sir) D.* B. A. Rp. (1840) (pt. 2) 6-.
- , heated, effects on polarised light. *Brewster, (Sir) D.* Phil. Trans. (1816) 46-.
- , —, —, —, (Brewster). *Schweigger, J. S. C.* Schweigger J. 18 (1816) 256-.
- , —, and unannealed drops, optical properties and structure. *Brewster, (Sir) D.* [1814] Phil. Trans. (1815) 1-.
- , plates, vibrating, property. *Biot, J. B.* Par. S. Phlm. Bll. (1819) 174-.
- , strained (lecture experiment). *Mack, K.* A. Ps. C. 69 (1899) 801-.
- , —, neutral axes as seen by polarised light, experiments. *Nickerson, L.* Franklin I. J. 65 (1873) 113-; Am. S. CE. T. 3 (1875) 31-.
- , unannealed, polarisation. *Brewster, (Sir) D.* [1814] Phil. Trans. (1814) 436-; (1815) 1-.
- , Interference experiments with polarised light. *Arago, D. F. J., & Fresnel, —.* A. C. 10 (1819) 288-.
- , —, —, —, Fresnel-Arago, new form. *Mach, E., & Rosický, W.* [1875] Wien Ak. Sb. 72 (1876) (Ab. 2) 197-.
- , —, —, —, simple modification. *Kolděk, F.* Carl Rpm. 15 (1879) 672-.

## UNIAXIAL CRYSTALS.

in convergent light, chromatic polarisation. *Willigen, V. S. M. van der.* Amst. Vs. Ak. 7 (1873) 71-; Harl. Arch. Ms. Teyl. 3 (1874) 241-, 388.

- Metallic plates, compressed, phenomena. *Casari, L.* A. Sc. Lomb. Ven. 8 (1838) 142-.
- Optical torque. *Thompson, S. P.* R. I. P. 12 (1889) 474-.
- Organic substances, cross in polarised light. *Lang, V. von.* A. Ps. C. 123 (1864) 140-.
- Polarised light, singular property. *Moigno, F.* C. B. 22 (1846) 161-.
- Pressure on gelatin, polarisation due to. *Brewster, (Sir) D.* Phil. Trans. (1815) 60-.
- , polarisation due to. *Biot, J. B.* A. C. 3 (1816) 396-; Par. S. Phm. Bll. (1816) 49-.
- Strains, distribution, studied by polarised light. *Marston, A.* Pa. Rv. 1 (1894) 127-.
- , —, — — — —. *Crandall, C. L., & Marston, A.* Am. S. CE. T. 32 (1894) 99-.

#### 4040 Rotatory Polarisation and Dispersion, Structural and Magnetic. General.

(See also 6650, 6655; Chemistry 7315.)

##### ROTATORY DISPERSION.

- Grimbert, L.* J. Phm. 16 (1887) 295-, 345-.
- Guye, P. A., & Jordan, C.* Arch. So. Ps. Nt. 1 (1896) 476-, 581.
- Absorption and dispersion of light by media with rotatory power. *Cotton, A.* A. C. 8 (1896) 347-.
- of light by media with rotatory power. *Carvallo, E.* C. R. 122 (1896) 985-.
- , unequal, of right- and left-handed circular vibrations in rotating substances. *Cotton, A.* C. R. 120 (1895) 989-.
- Anomalous dispersion of absorbing substances. *Cotton, A.* C. R. 120 (1895) 1044-.
- , case. *Wyss, G. H. von.* A. Ps. C. 33 (1888) 554-.
- , — (Wyss). *Lippich, F.* A. Ps. C. 36 (1889) 767-.
- of crystals. *Moreau, G.* C. R. 120 (1895) 258-.
- Chromatic polarisation, theory. *Cauchy, A. L.* C. R. 18 (1844) 961-; 25 (1847) 331-.
- Colours developed in homogeneous liquids by polarised light. *Fresnel, A. J.* [1818] Par. Mm. Ac. Sc. 20 (1849) 163-.
- — — — — (memoir by Fresnel, supposed to be lost). *Biot, J. B.* C. R. 22 (1846) 405-.
- Compensation of dispersion due to unequal rotatory power. *Biot, J. B.* C. R. 35 (1852) 613-; A. C. 36 (1852) 405-.
- Elements of natural bodies and optical effects, new relation between. *Biot, J. B.* C. R. 2 (1836) 540-.
- Examples. *Guye, P. A., & Melikian, P. A.* C. R. 123 (1896) 1291-.
- Law. *Lommel, E. C. J.* A. Ps. C. 20 (1888) 578-.
- Quartz, dispersion of infra-red rays. *Desains, P.* C. B. 62 (1866) 1277-.

- Quartz, dispersion of infra-red rays. *Dongier, R.* C. R. 125 (1897) 228-.
- , — — light on rotation of plane of polarisation. *Stefan, J.* [1864] Wien Sb. 50 (1865) (Ab. 2) 88-.
- plate cut at right angles to axis, deviations from plane of polarisation of resultant colours in. *Soleil, H.* C. B. 53 (1861) 640-.
- Sugar solutions, dispersion of colours on rotation of plane of polarisation. *Stefan, J.* [1865] Wien Sb. 52 (1866) (Ab. 2) 486-.

##### ROTATORY POLARISATION.

- Babinet, J.* C. R. 4 (1837) 900-.
- (Babinet.) *Biot, J. B.* C. R. 4 (1837) 917-.
- Laurent, P. A.* C. B. 18 (1844) 986-.
- (Laurent.) *Cauchy, A. L.* C. B. 18 (1844) 940-.
- (—.) *MacCullagh, J. B. A.* Bp. (1844) (pt. 2) 7.
- Briot, C.* C. B. 50 (1860) 141-.
- Gladstone, J. H.* [1860] C. S. J. 13 (1861) 254-.
- (Briot.) *Błajewski, R. O.* [1873] (xii) Krk. Ak. (Mt.-Prz.) Rs. & Sp. 1 (1874) xi-.
- Landolt, H. H.* Lieb. A. 189 (1877) 241-.
- Anomalous rotation. *Dutoit, P., & Habel, W.* Arch. So. Ps. Nt. 8 (1899) 100.
- Applications. *Tait, P. G.* Edinb. B. S. P. 10 (1880) 473-.
- to determination of organic substances. *Otto, J.* Arch. Mth. Ntvd. 12 (1888) 158-.
- Asymmetry, molecular. *Guye, P. A.* C. B. 110 (1890) 714-; 111 (1890) 745-; A. C. 25 (1892) 145-.
- , —, and rotatory power of organic compounds. (Guye's theory of optical activity.) *Piutti, A.* Nap. Rd. 33 (1894) 75-.
- Bi- and mono-refractive substances. *Quesneville, G.* Mon. Sc. 2 (1898) 1074-.
- Bi-refractive substances. *Quincke, G.* D. Nf. B. (\*1883) 64.
- Bodies which rotate plane of polarisation. *Polli, G.* Polli A. 17 (1853) 125-.
- Case, new. *Wulff, J. V.* Rs. Ps.-C. S. J. 23 (Ps.) (1891) 436-; J. de Ps. 1 (1892) 405.
- Castor oil. *Popp, O.* (xii) Arch. Phm. 195 (1871) 233-.
- Colours of rotatory polarisation. *Haidinger, W.* Moigno Cosmos 6 (1855) 454-.
- Crystalline mixtures of isomorphous substances, optical properties, and explanation of rotatory polarisation. *Mallard, E.* A. Mines 19 (1881) 256-; C. R. 92 (1881) 1155-.
- reflection, internal, in crystal with rotatory power. *Brunhes, B.* Arch. Néerl. 5 (1900) 1-.
- Crystals, dextro- and laevo-rotating, separation. *Kreider, D. A.* Am. J. Sc. 8 (1899) 133-.
- , rotatory, in state of powder, behaviour. *Landolt, H.* Berl. B. 29 (1896) 2404-.
- , —, structure. *Wyrouboff, G.* J. de Ps. 5 (1886) 258-.
- , uni- and biaxial, hemihedral or hemimorphic forms, relation to phenomena of rotatory polarisation. *Descloiseaux, A. B.* A. Bp. (1862) (pt. 2) 19-.

- Direction, indication. *Govi, G.* C. R. 91 (1880) 517-.
- of rotation of optically active substances, change. *Landolt, H. H.* Berl. B. 13 (1880) 2329-.
- Energy transmission, application to rotatory polarisation. *Broca, A.* C. R. 125 (1897) 765-.
- Experimental model. *Mauritius, —.* Exner Rpm. 20 (1884) 556-.
- Fresnel's works. *Baumgartner, A. von.* Baumgartner Z. 2 (1837) 1-.
- Gyrostatically loaded chain, vibrations, rotatory polarisation illustrated by. *Larmor, J.* [1890] L. Mth. S. P. 21 (1891) 423-.
- — media, propagation of disturbances in, and rotatory polarisation of light. *Larmor, J.* [1891] L. Mth. S. P. 23 (1892) 127-.
- Infra-red rays. *Tyndall, J.* J. de Ps. 1 (1872) 101-.
- Isotropic media, polarisation in. *Niven, C.* QJ. Mth. 9 (1868) 235-.
- Liquids (various). *Arndtæen, A.* C. R. 47 (1858) 738-; A. C. 54 (1858) 403-.
- which rotate plane of polarisation. *Dove, H. W.* Berl. Mb. (1860) 292-.
- , rotatory polarisation, method of increasing. *Botzenhart, —.* Haidinger B. 2 (1846-47) 178-.
- , —, phenomena. *Pasteur, L.* J. Phm. 13 (1848) 449-.
- , — by transmission through. *Leeson, H. B.* [1848] C. S. Mm. 2 (1848-49) 26-.
- , — power, laws of variation. *Biot, J. B.* C. R. 31 (1850) 101-; A. C. 29 (1850) 480-.
- , similar action on polarised light, in motion and at rest. *Biot, J. B.* C. R. 17 (1843) 1209-.
- Magnetic and rotatory polarisation. *Moreau, G.* A. C. 1 (1894) 289-.
- rotatory polarisation, influence of temperature. *Hirsch, E.* A. Ps. C. 48 (1893) 446-.
- Mathematical analysis applied to physical phenomena. *Cauchy, A. L.* C. R. 15 (1842) 910-.
- Optically active substances, influence of inactive solvents. *Oudemans, A. C.* (jun.). Amst. Vs. Ak. 6 (1872) 334-; Arch. Néerl. 8 (1878) 63-.
- , —, —. *Baumgartner, G.* Carl Rpm. 12 (1876) 80-.
- , —, — and concentration. *Hoorweg, J. L.* [1872] (xii) Mbl. Nt. 3 (1873) 12-.
- Parallel light, rotatory polarisation in. *Quesneville, G.* Mon. Sc. 1 (1887) 695-, 1187-.
- Passage of light through plate of rotatory polarising material. *Voigt, W.* A. Ps. C. 22 (1884) 237-.
- Pressure, influence on various physical phenomena. *Röntgen, W. C.* A. Ps. C. 45 (1892) 98-.
- Sarasin, É., & Soret, J. L.* Arch. Sc. Ps. Nt. 54 (1875) 253-; C. R. 81 (1875) 610-; 83 (1876) 818-; 84 (1877) 1362-; 95 (1882) 635-; Arch. Sc. Ps. Nt. 8 (1882) 5-, 97-, 201-.
- Lang, V. von.* [1876] Wien Ak. Sb. 74 (1877) (Ab. 2) 209-.
- Carvalho, E.* A. C. 26 (1892) 113-.
- König, W.* Frkf. a. M. Ps. Vr. Jbr. (1893-94) 26-.
- graphic table of coloration produced by, in polarised light. *D'Henry, L.* Par. S. Ps. Sé. (1884) 68-.
- optical properties and crystalline form, connection. *Dove, H. W.* Pogg. A. 40 (1837) 607-.
- quadruple refraction near axis. *Quesneville, G.* Mon. Sc. 7 (1893) 521-.
- rotation of infra-red rays. *Desains, P.* C. R. 84 (1877) 1056-.
- — —. *Hussell, A.* A. Ps. C. 43 (1891) 498-.
- — —. *Carvalho, E.* C. R. 114 (1892) 288-.
- — —. *Moreau, G.* A. C. 30 (1893) 433-.
- — —. *Dongier, R.* C. R. 126 (1898) 1627-; A. C. 14 (1898) 331-.
- rotatory power and structure. *Soleil, —.* C. R. 20 (1845) 435-.
- in ultra-violet. *Croullebois, M.* C. R. 81 (1875) 666-.
- under stress, optical behaviour. *Wiechmann, F. G.* Sch. Mines Q. N. Y. 20 (1899) 267-.
- Rotation, new agent for increasing angle of. *Walden, P.* Berl. B. 30 (1897) 2859-.
- of polarised light by certain substances. *Biot, J. B.* Par. Ac. Sc. Mm. 2 (1817) 41-.
- — — transparent bodies, dynamical illustrations. *Thomson, (Sir) W.* [1856] R. S. P. 8 (1856-57) 150-.
- Rotatory polarisation and its applications. [*Friedrich, —,* non] *Friedreich, N.* Halle Z. Nw. 1 (1870) 62-.
- power, cause of change. *Bremer, G. J. W.* Utr. Prv. Gn. Aant. (1882) 6-; Mbl. Nt. (1882-84) 19-.
- and chemical composition and crystalline form, relation. *Pasteur, L.* C. R. 26 (1848) 535-.
- — — — — (Pasteur). *Biot, J. B.* C. R. 27 (1848) 401-.
- — — — —, —. *Pasteur, L.* A. C. 24 (1848) 442-; C. R. 28 (1849) 477-; A. C. 31 (1851) 67-; C. R. 31 (1850) 480-.
- — — — — (Pasteur). *Biot, J. B.* C. R. 31 (1850) 601-; Par. Ac. Sc. Mm. 23 (1853) 67-.
- — — — —, —. *Pasteur, L.* C. R. 35 (1852) 176-; A. C. 38 (1853) 437-.
- — — — —, relation. *Oudemans, A. C.* (jun.). Amst. Ak. Vs. M. 1 (1885) 408-; Delft Éc. Pol. A. 3 (1887) 91-.
- , double, new substance with. *Wyrouboff, G.* Par. S. Ps. Sé. (1894) 200-.
- and double refraction. *Monnory, —.* J. de Ps. 9 (1890) 277-.

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- Herschel, (Sir) J. F. W.* [1820] Camb. Ph. S. T. 1 (1822) 43-.
- Biot, J. B.* C. R. 6 (1839) 668-; 21 (1845) 643-; 22 (1846) 98-; Par. Ac. Sc. Mm. 20 (1849) 221-.

- Rotatory power and double refraction, combined effects. *Gouy*, —. C. R. 100 (1885) 100–, 200; J. de Ps. 4 (1885) 149–.
- — — — of quartz under pressure. *Monnory*, —. C. R. 112 (1891) 428–, 504.
- — — — —, and in natural state. *Beaulard*, F. Mars. Fac. Sc. A. 3 (1893) Fasc. 1, 155 pp.
- — — — —, superposition. *Dongier*, R. A. C. 14 (1898) 510–.
- — — — — electrolytic dissociation. *Carrara*, G. Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 2) 148–.
- — — — —. *Carrara*, G., & *Gennari*, G. Rm. R. Ac. Linc. Rd. 8 (1894) (Sem. 2) 325–.
- — — — —, temperature variation. *Guye*, P. A. Arch. Sc. Ps. Nt. 31 (1894) 98–.
- — — — —. *Le Bel*, A. C. R. 118 (1894) 916–.
- — — — —. *Colson*, A. C. R. 119 (1894) 65–.
- — — — —. *Colson*. *Le Bel*, A. C. R. 119 (1894) 226–.
- Solids, molecular rotatory power. *Biot*, J. B. C. R. 29 (1849) 681–; A. C. 28 (1850) 215–, 351–.
- Sources of error. *Hölzer*, A. Berl. B. 15 (1882) 1932–.
- Sugar solutions. *König*, W. Frkf. a. M. Ps. Vr. Jbr. (1893–94) 26–.
- Theory. *Lang*, V. von. Pogg. A. 119 (1863) 74–; Wien Ak. Sb. 75 (1877) (Ab. 2) 719–.
- *Lommel*, E. C. J. Münch. Ak. Sb. 11 (1881) 454–; 12 (1882) 56.
- *Soret*, C. Arch. Sc. Ps. Nt. 11 (1884) 330–, 412–; 24 (1890) 591–.
- *Wulff*, G. V. Rs. Ps.-C. S. J. 19 (Ps.) (1887) 13–; J. de Ps. 7 (1888) 272–.
- , kinetic. *Beckenkamp*, J. A. Ps. C. 67 (1899) 474–.
- , mathematical. *Carvalho*, E. C. R. 113 (1891) 846–.
- Torque, optical. *Thompson*, S. P. R. I. P. 12 (1889) 474–.
- Torsion, rotatory polarisation due to. *Ewell*, A. W. Am. J. Sc. 8 (1899) 89–; J. H. Un. Cir. [19 (1899–1900)] 64.
- Velocity of polarised light in active media. *Righti*, A. Bologna Ac. Sc. Mm. 6 (1884) 159–.
- Alkaloids, cinchona, optical properties of modifications. *Howard*, D. C. S. J. 11 (1873) 1177–.
- — — — —, specific rotatory power in free and combined states. *Oudemans*, A. C. (jun.) [1875] Amst. Ak. Vh. 16 (1876) 180 pp.; Arch. Néerl. 10 (1875) 193–.
- — — — —, laws which regulate specific rotatory power under influence of acids. *Oudemans*, A. C. (jun.) (xii) Rec. Tr. C. P.-Bas 1 (1882) 18–.
- Amygdalin. *Bouchardat*, A. C. R. 19 (1844) 1174–.
- Amylic series. *Riban*, J. Par. Bll. S. C. 15 (1871) 3–.
- Apocinchonine and hydrochloroapocinchonine, specific rotatory power under influence of acids. *Oudemans*, A. C. (jun.) [1882] Amst. Ak. Vs. M. 18 (1883) 178–; Arch. Néerl. 17 (1882) 391–.
- Asparagin and aspartic acid, in different solvents. *Becker*, Arm. Berl. B. 14 (1881) 1028–.
- Benzile, crystals. *Des Cloizeaux*, A. C. R. 66 (1869) 308–.
- Camphor and other bodies. *Montgolfer*, J. de. Par. S. C. Bll. 22 (1874) 487–.
- oil. *Biot*, J. B. C. R. 9 (1839) 621–.
- , specific rotatory power. *Landolt*, H. H. Berl. B. 9 (1876) 914–.
- Camphoric acid. *Bouchardat*, A. C. R. 28 (1849) 319–.
- — (Bouchardat). *Biot*, J. B. C. R. 28 (1849) 321.
- Carbohydrates, rotatory power and crystalline form, relation between. *Scheibler*, C. B. W. Berl. B. 13 (1880) 2319–.
- Chrysoberyl. *Biot*, J. B. A. C. 13 (1845) 335–.
- Cnicin. *Bouchardat*, A. C. R. 18 (1844) 296–; Erdm. J. Pr. C. 32 (1844) 86–.
- Codeine, artificial. *Grimaux*, É. C. R. 92 (1881) 1228–.
- Crystals of cubic system. *Biot*, J. B. C. R. 40 (1855) 792–; 45 (1857) 705–.
- , rotatory power, and Reusch's mica combination. *Sohncke*, L. D. Nf. Tbl. (\*1875) 52–; A. Ps. C. (Ergänz.) 8 (1878) 16–.
- Glutanic and malic acids. *Ritthausen*, H. Bonn SB. Niedr. Gs. (1871) 115; J. Pr. C. 113 (1872) 354–.
- Homologous series, bodies belonging to. *Guye*, P. A. C. R. 116 (1898) 1451–.
- Hyposulphates. *Bichat*, E. C. R. 77 (1873) 1189–.
- Inulin. *Bouchardat*, A. C. R. 25 (1847) 274–.
- Lactose, specific rotatory power. *Meissl*, Em. [1879] J. Pr. C. 22 (1880) 97–.
- Leucine and cystine. *Mauthner*, J. J. Phm. 7 (1883) 402–.
- Liquid mixtures of given rotatory power. *Biot*, J. B. A. C. 18 (1846) 81–.
- possessing opposite rotatory powers for rays at opposite ends of spectrum. *Jellett*, J. H. [1866] Ir. Ac. P. 9 (1867) 530–.
- Liquids, temperature variation. *Aignan*, —. [1893] Bordeaux S. Sc. Mm. 4 (1894) xxvii–.

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- Nasini*, R. Rm. R. Ac. Linc. Mm. 9 (1881) 253–.
- Active bodies, molecular rotatory power. *Aignan*, A. [1894–95] Bordeaux S. Sc. Mm. 5 (1895) xxxii–; C. R. 120 (1895) 723–.
- — — — — in solution, specific rotatory power. *Aignan*, A. [1892–94] Bordeaux S. Sc. Mm. 3 (1893) 331–; A. C. 1 (1894) 433–.
- Alkaloids. *Bouchardat*, A. A. C. 9 (1843) 213–.
- *Bouchardat*, A., & *Boudet*, F. J. Phm. 23 (1853) 288–.
- , cinchona. *Hesse*, O. Lieb. A. 182 (1876) 128–.

- Liquids, temperature variation. *Colson, A.* C. R. 116 (1893) 319-.
- , —. *Guye, P. A., & Aston, (Mlle.) E.* C. R. 124 (1897) 194-; 125 (1897) 819-.
- and their vapours. *Gernez, D.* C. R. 58 (1864) 1108-; Par. Éc. Norm. A. 1 (1864) 1-.
- Malic acid, anomalous rotatory dispersion. *Nasini, R., & Gennari, G.* Ven. I. At. (1894-95) 915-.
- , optical properties. *Bell, L.* [1885] Am. C. J. 7 (1885-86) 120-.
- , rotatory polarisation. *Kann, L.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 681-.
- Mannite. *Vignon, L.* C. R. 77 (1873) 1191-; Par. Bll. S. C. 20 (1873) 532-.
- derivatives. *Bouchardat, G.* C. R. 76 (1873) 1550-.
- and its derivatives. *Bouchardat, G.* C. R. 84 (1877) 34-.
- — — —. *Loir, A.* Lyon Ac. Mm. (Sc.) 22 (1876-77) 157-.
- , specific rotatory power. *Bouchardat, G.* C. R. 80 (1875) 120-.
- Molecular rotatory power. *Wilhelmy, L.* Pogg. A. 81 (1850) 527-.
- — —. *Wyrouboff, G.* Par. S. Ps. 86 (1892) 357-; A. C. 1 (1894) 5-.
- Organic substances, rotatory dispersive power. *Nasini, R.* Rm. R. Ac. Linc. Mm. 13 (1882) 129-.
- Phloridzin. *Bouchardat, A.* C. R. 18 (1844) 298-; Erdm. J. Pr. C. 32 (1844) 86-.
- Photosantonioic acid. *Nasini, R.* Rm. R. Ac. Linc. T. 7 (1883) 260-.
- Populin and salicin. *Biot, J. B., & Pasteur,* —. C. R. 34 (1852) 606-.
- Quartz. *Wasastjerna, L.* Helsingf. Öfv. 31 (1889) 167-.
- , rotatory dispersion and temperature coefficient. *Gumlich, E.* A. Ps. C. 64 (1898) 333-.
- , — polarisation, and its relation to wave-length. *Peddie, W.* Edinb. R. S. P. 11 (1882) 815-.
- , — power, at low temperatures. *Soret, C., & Guye, C. E.* [1892] C. R. 115 (1892) 1295-; 116 (1893) 75; Arch. Sc. Ps. Nt. 29 (1893) 106, 242-.
- , — for sodium light. *Gumlich, E.* Berl. Ps. Reichsanst. Ab. 2 (1895) 201-.
- , —, temperature variation. *Lang, V. von.* Wien Ak. Sb. 71 (1875) (Ab. 2) 707-.
- , —, — —. *Gernez, D.* Par. S. Ps. 86 (1878) 210-.
- , —, — —. *Joubert, J.* C. R. 87 (1878) 497-; Par. S. Ps. 86 (1878) 204-.
- , — for various wave-lengths. *Quesneville, G.* Mon. Sc. 1 (1887) 441-.
- Quinamine. *Hesse, O.* Lieb. A. 199 (1879) 333-.
- Quinine. *Alluard, —, & Vry, — de.* C. R. 59 (1864) 201-.
- and cinchonine, specific rotatory power. *Bouchardat, G.* Par. Bll. S. C. 20 (1873) 15-.
- solutions, temperature variation. *Draper, J. C.* [1875] Am. J. Sc. 11 (1876) 42-.
- Salicin and derivatives. *Bouchardat, A. C.* R. 18 (1844) 298-; Erdm. J. Pr. C. 32 (1844) 86-; C. R. 20 (1845) 1635-.
- Santonio, metasantonio and hydrosantonio acids in various solvents. *Cannizzaro, S.* Rm. R. Ac. Linc. At. 3 (1876) (Pte. 1) 113-.
- Santonin, derivatives. *Carnelutti, G., & Nasini, R.* Gz. C. It. 10 (1880) 518-; Rm. R. Ac. Linc. T. 5 (1881) 283-.
- Silk. *Vignon, L.* C. R. 113 (1891) 802-; Par. S. C. Bll. 7 (1892) 5-.
- Silks, various. *Vignon, L.* C. R. 114 (1892) 129-.
- Sodium chlorate. *Guye, C. E.* Arch. Sc. Ps. Nt. 22 (1889) 180-.
- , for various wave-lengths. *Guye, C. E.* C. R. 108 (1889) 348-.
- Solution, aqueous, substances in. *Guye, P. A.* [1892] Arch. Sc. Ps. Nt. 29 (1893) 97-.
- Solutions. *Wyrouboff, G.* C. R. 115 (1892) 832-.
- , molecular rotatory power. *Pottevin, H.* J. de Ps. 8 (1899) 373-.
- Strychnine sulphate. *Descloizeaux, A.* C. R. 44 (1857) 909-.
- Styrolene. *Berthelot, M.* C. R. 82 (1876) 441-; Par. S. C. Bll. 25 (1876) 197-; 31 (1879) 232-.
- m-Styrolene. *Berthelot, M.* C. R. 85 (1877) 1191-.
- Substance, new, with double rotatory power. *Wyrouboff, G.* Par. S. Ps. 86 (1894) 200-.

## SUGAR.

- Biot, J. B.* C. R. 2 (1836) 464-.
- Fischer, E.* D. Nf. Tbl. (1899) 247-.
- beet-root, inversion process. *Wiechmann, F.* G. Sch. Mines Q. N. Y. 6 (1885) 257-.
- cane. *Mascart, É., & Bénard, H.* A. C. 17 (1899) 125-.
- , action of certain inorganic salts. *Farnsteiner, E.* Berl. B. 23 (1890) 3570-.
- and invert, specific rotatory power. *Allen, A. H.* C. N. 42 (1880) 177, 269-.
- — — —. *Bayley, T.* C. N. 42 (1880) 233.
- , rotation constants. *Thomsen, T.* Berl. B. 14 (1881) 1651-.
- , solutions, influence of pressure. *Siertsema, L. H.* Amst. Ak. Vs. 5 (1897) 305-; 6 (1898) 24-; Arch. Néerl. 3 (1900) 79-.
- , specific rotatory power. *Tollens, B.* Berl. B. 10 (1877) 1403-; 11 (1878) 1800-.
- , — — —. *Schmitz, M.* Berl. B. 10 (1877) 1414-.
- , — — —. *Tollens, B.* Berl. B. 13 (1880) 2297-.
- , — — —, temperature variation. *Wiechmann, F. G.* Sch. Mines Q. N. Y. 21 (1900) 299-.
- grape, pure, specific rotatory power. *Hoppe-Seyler, F.* [1866] Md. C. Üs. 1 (1866-71) 163-.
- , rotation constants. *Hoppe-Seyler, F.* Fresenius Z. 14 (1875) 303-.
- , specific rotatory power. *Tollens, B.* Berl. B. 9 (1876) 487-, 615-, 1531-.

- grape, specific rotatory power. *Gall, H.* Mon. Sc. 24 (1882) 1201-.
- invert, crystalline magma. *Wiechmann, F. G.* Sch. Mines Q. N. Y. 13 (1892) 149-.
- maltose, specific rotatory power. *Ost, H. C.* Ztg. 19 (1895) 1727-; 21 (1897) 613-.
- saccharimetry. *Schwippel, C.* Brünn Vh. 2 (1863) 15-.
- , *Stammer, K. A.* Gén. Civ. 8 (1874) 427-.
- specific rotation, temperature variation. *Schönrock, O.* Z. Instk. 20 (1900) 97-.
- Tartaric acid. *Biot, J. B.* C. R. 1 (1835) 457-; A. C. 28 (1850) 99-.
- and malic acid, molybdo- and tungsto-alkali salts, specific rotatory power. *Rosenheim, A., & Itzig, H.* Berl. B. 33 (1900) 707-.
- , optical properties. *Bell, L.* [1885] Am. C. J. 7 (1885-86) 120-.
- , rotatory dispersion. *Wendell, G. V.* A. Ps. C. 66 (1898) 1149-.
- , — power, change in mixed solutions. *Pfriam, R.* Berl. B. 22 (1889) 6-.
- Tartrates, rotatory dispersion. *Kümmell, G.* A. Ps. C. 43 (1891) 509-.
- Tartromethylic and tartrovinic acids. *Biot, J. B.* C. R. 2 (1836) 618-.
- Turpentin, rotatory dispersion. *Wendell, G. V.* A. Ps. C. 66 (1898) 1149-.

### THE EMISSION AND ANALYSIS OF RADIATION, PHOSPHORESCENCE, RADIOACTIVITY, SPECTRA, ETC.

#### 4200 General.

(See also 3010, 3850.)

- Absorption and emission by gases. *Gladstone, J. H. B. A.* Rp. (1861) (pt. 2) 79.
- — — — —. *Pringsheim, E.* [1900] Sc. Abs. 4 (1901) 489-.
- — — measurement. *Grosse, W.* Z. Instk. 9 (1889) 1-.
- — — by platinum black and lamp black, variation with thickness of emitting layer. *Kuribaum, F.* A. Ps. C. 67 (1899) 846-.
- — —, proportionality between. *Voigt, W.* A. Ps. C. 67 (1899) 866-.
- — — and reflection of quartz, mica and glass. *Rosenthal, H.* A. Ps. C. 68 (1899) 783-.
- — —, simultaneous, of rays of same refrangibility discovered by Foucault and extended by Kirchhoff. *Stokes, G. G.* Ph. Mg. 19 (1860) 196-.
- — radiation. *Tyndall, J.* Ph. Mg. 22 (1861) 377-.
- — —. *Lecher, E.* Wien Ak. Sb. 85 (1882) (Ab. 2) 441-.
- — — of heat by gaseous matter. *Tyndall, J.* [1861-63] Phil. Trans. (1861) 1-; C. R. 52 (1861) 364-; Phil. Trans. (1862) 59-; (1864) 201-.

- Absorption and emission of heat by leaves. *Mayer, A. G.* Am. J. Sc. 45 (1898) 340-.
- Air-gun discharge, light caused in. *Grotthus, T. von.* Gilbert A. 33 (1809) 212-; Schweigger J. 5 (1812) 215-.
- — — — —. *Hart, J.* QJ. Sc. 15 (1823) 64-.
- Artificial light. *Anon.* (vi 305) Coimbra I. 5 (1857) 64-.
- — of the future, necessary conditions. *Palaz, A.* Rv. Sc. 48 (1891) 79-.
- Atomic motions as cause of radiation. *Hoppe-Seyler, F.* A. Ps. C. 147 (1872) 101-.
- — — — —. *Eddy, H. T.* Science 2 (\*1883) 76-, 123-.
- — — — —. *Hüssler, A.* Exner Rpm. 24 (1888) 782-.
- Bolometric measurements, sensitiveness. *Ångström, K.* Stockh. Ötv. (1888) 379-; Föchr. Ps. (1888) (Ab. 2) 376.
- Colour of daylight and of artificial sources of light. *Memorsky, M.* Wien Sb. 53 (1866) (Ab. 2) 345-.
- , influence on heat and odours. *Stark, J.* Phil. Trans. (1833) 285-.
- , — — — — — (Stark). *Powell, B.* Edinb. N. Ph. J. 17 (1834) 228-.
- Disintegration of bodies by ultra-violet light. *Lenard, P., & Wolf, M.* A. Ps. C. 37 (1899) 443-.
- Emission of light, application of mechanical principles. *Clifton, R. B.* [1865] Manch. Lt. Ph. S. P. 5 (1866) 24-.
- — — from hot bodies, experiment. *Braun, F.* A. Ps. C. 33 (1888) 413-.
- spectra, influence of frequency and damping of molecules. *Jaumann, G.* Wien Ak. Sb. 103 (1894) (Ab. 2a) 317-; A. Ps. C. 54 (1895) 178-.
- Evolution of light in polishing of hard minerals. *Nöggerath, J. J.* A. Ps. C. 150 (1873) 325-.
- Force, new? *Thore, J.* Dax S. Borda Bll. (1887) 51-, 83-, 117-; (1888) 19-.
- — (Thore). *Crookes, W.* [1887] Phil. Trans. (A) 178 (1888) 451-.
- — — — —. *Shettle, R. C.* Elect. 19 (1887) 319-, 360-, 443.
- — — (Crookes). *Thore, J.* Rv. Sc. 40 (1887) 117-.

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- coal-gas. *Anderson, A.* Edinb. Ph. J. 12 (1825) 169-, 382-.
- — —. *Aikin, W. E. A.* Am. As. P. (1858) 133-.
- — and oil. *Fyfe, A.* Edinb. Ph. J. 11 (1824) 367-.
- and consumption of common sources of light. *Heim, C.* Dingler 266 (1887) 37-.
- of distillation-products of lignite. *Zincken, [C. F. non]* J. C. L. Dingler 155 (1860) 128-.
- gas, variation during passage through pipes. *Leblanc, R.* As. Fr. C. B. (1880) 389-.



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- of hydrocarbons and their mixtures, calculation. *Bosanquet, R. H. M.* Ph. Mg. 34 (1892) 120-, 355-.
- mixture of hydrogen with hydrocarbons. *Harcourt, A. G. V. B. A. Rp.* (1879) 319-.
- different oils. *Pagliani, S., & Vicentini, G.* N. Cim. 14 (\*1883) 117-.
- olive and rape oils. *Heeren, F., & Karmarsch, —.* Dingler 80 (1841) 60-.
- wood-gas, with varying contents of carbon dioxide and with various burners, comparative experiments. *Stammer, K.* Dingler 155 (1860) 354-.
- Incandescence, galvanic, dependence on nature of surrounding gas. *Clausius, R.* Pogg. A. 87 (1852) 501-.
- Incandescent platinum and vapour radiations. *Garibaldi, P. M.* (ix) N. Cim. 3 (1870) 231-.
- solid and liquid surfaces, polarisation of light emitted by. *Millikan, R. A.* N. Y. Ac. T. 14 (1895) 155-.
- Kirchhoff's law as to relation between emission and absorption of light, extension. *Rizzo, G. B.* Tor. Ac. Sc. At. 29 (1894) 424-.
- , validity. *Paschen, F. A.* Ps. C. 51 (1894) 40-.
- principle, mechanical illustration. *Hallock, W.* Science 9 (1899) 210-.
- theorem applied to crystalline media. *Šebuev, G. N.* Kazan S. Nt. (Ps.-Mth.) P. 5 (1887) 48-.
- Light, heat and electricity, causes and effects. *Seguin, — (ainé).* Cosmos 2 (1865) 731-.
- , — —, general theory, and Neef's experiments. *Moigno, F.* Rv. Sc. 9 (1846) 153-.
- , — — — and sound, relations. *Ørsted, H. C.* Kiøb. Ov. (1829-30) 24-.
- , —, etc., motion of light bodies due to. *Dumont, —.* Nancy S. Sc. Bll. (1886) (Fasc. 20) xxix-.
- Luminosity of candle or gas flame, cause. *Burch, G. J.* Nt. 31 (1885) 272-; 35 (1887) 165-.
- , mechanics of. *Wiedemann, E. A.* Ps. C. 37 (1889) 177-.
- and supposed phosphorescence of glaciers and snow. *Mercanton, P. L.* Laus. S. Vd. Bll. 34 (1898) 231-.
- Microradiometer. *Weber, H. F.* Sch. Nf. Gs. Vh. (1886-87) 47-.
- Particles, solid, in flame. *Stokes, (Sir) G. G.* Edinb. R. S. P. 18 (1892) 263-.
- Photodynamics. *Chase, P. E.* [1881-82] Am. Ph. S. P. 19 (1882) 203-, 262-, 354-, 448-, 567-; 20 (1883) 237-, 406-, 566-.

### PHOTOPHONE (RADIOPHONE).

- Bell, A. G.* [1880] Am. As. P. 29 (1881) 115-.
- (Application to solar disturbances.) *Bell, A. G.* C. R. 91 (1880) 726-.
- (Use of selenium.) *Bell, A. G.* Nt. 22 (1880) 500-.
- Bidwell, S.* [1880] Nt. 23 (1881) 58-.

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- (Selenium receivers.) *Breguet, A. A. C.* 21 (1880) 560-.
- Breguet, A. A.* Tél. 7 (1880) 427-.
- (Bell and Tainter's experiments.) *Breguet, A. C. R.* 91 (1880) 595-.
- (Light, mechanical actions.) *Cros, C. C. R.* 91 (1880) 622-.
- (Bell's and Tainter's photophone.) *Breguet, A. C. R.* 91 (1880) 652-.
- Du Moncel, T.* Lum. Élect. 2 (\*1880) 377-.
- (Tests with spectra.) *Mercadier, E. C. R.* 91 (1880) 929-, 982; 92 (1881) 409-, 450-, 1224-, 1226-.
- Preece, W. H.* Tel. E. J. 9 (1880) 363-.
- Bell, A. G.* Am. J. Sc. 21 (1881) 463-; C. R. 92 (1881) 1206-; Cn. Nt. 9 (1881) 397-.
- (Spectrophone.) *Bell, A. G.* [1881] Smiths. Misc. Col. 25 (1883) Art. 1, 143-. (Wash. Ph. S. Bll. 4 (1881).)
- (Modification of Wheatstone's microphone applied to radiophonic researches.) *Bell, A. G.* [1881] Smiths. Misc. Col. 25 (1883) Art. 1, 183-. (Wash. Ph. S. Bll. 4 (1881).)
- (Use of selenium.) *Bidwell, S.* [1881] B. I. P. 9 (1882) 524-.
- (Sonorescence, term expressing change of radiant heat and light into sound.) *Cook, E. H.* Ph. Mg. 11 (1881) 377-.
- Dufour, H.* Laus. S. Vd. Bll. 17 (1881) 476-.
- (Bell's spectrophone.) *Dufourcet, E.* (xii) Dax S. Borda Bll. 6 (1881) 205-.
- (Preece's investigations.) *Géraldy, F.* Lum. Élect. 3 (\*1881) 297-.
- (Use of selenium.) *Jamieson, A.* [1881] Glasg. Ph. S. P. 13 (1882) 109-.
- (Without battery.) *Kalischer, S.* Carl Bpm. 17 (1881) 563-.
- (Photophony and radiophony.) *Lucchi, G. de.* Ven. Aten. (1) (1881) 410-.
- (Use of selenium.) *Mercadier, E. C. R.* 92 (1881) 705-.
- (Influence of temperature on selenium receivers.) *Mercadier, E. C. R.* 92 (1881) 1407-.
- (Lamp-black instead of selenium.) *Mercadier, E. C. R.* 93 (1881) 457-.
- Mercadier, E.* Lum. Élect. 3 (\*1881) 8-, 37-, 51-, 276-, 291-, 356-, 408-; 4 (\*1881) 276-, 347-; 5 (\*1881) 105-, 119-.
- (Indirect radiophony.) *Mercadier, E.* Lum. Élect. 4 (\*1881) 295-.
- (Electric multiple autoreversible teleradiophone.) *Mercadier, E. C. R.* 93 (1881) 541-; Lum. Élect. 5 (\*1881) 19-.
- Munro, J.* J. Sc. 3 (1881) 208-.
- Preece, W. H.* Tel. E. J. 10 (1881) 212-.
- (Expansion of diaphragm.) *Rayleigh, (Lord).* Nt. 23 (1881) 274-.
- (Sounds due to intermittent radiation in gases.) *Röntgen, W. C.* Giessen Oberh. Gs. B. 20 (1881) 19-.
- (Construction.) *Thompson, S. P. L.* Ps. S. P. 4 (1881) 184-; Ph. Mg. 11 (1881) 286-.
- (Action of intermittent beam of radiant heat on gases.) *Tyndall, J.* R. S. P. 31 (1881) 307-, 478-.
- Preece, W. H.* R. S. P. 31 (1881) 506-.

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## Heat 4200

- (Radiant heat, conversion by free molecules into sound.) *Tyndall, J.* [1881] *Phil. Trans.* 173 (1883) 291-.
- Bartoniak, G.* *Termt. Közl.* 16 (1884) 331-.
- (Two new radiophones.) *Mercadier, E. C. R.* 101 (1885) 944-.
- Heritsch, A.* *A. Ps. C.* 29 (1886) 665-.
- (Electrochemical radiophony.) *Chaperon, G., & Mercadier, E. C. R.* 106 (1886) 1595-; *A. Tél.* 15 (1888) 425-.
- Mercadier, —, & Chaperon, —.* *Par. S. Ps. Sé.* (1890) 166-.
- (Production of sound in microphone by intermittent radiation.) *Semmola, E.* *Nap. I. Inc. At.* 6 (1893) No. 5, 5 pp.; *C. R.* 118 (1894) 525.
- (Sound transmission by ultra-violet rays (selenium).) *Dussaud, —.* *C. R.* 128 (1899) 171.

- Phototropy, temporary changes due to light. *Marckwald, J.* *Ps. Z.* 1 (1900) 147-.
- Platinum strip radiator (meldometer). *Gray, P. L.* [1894] *Birm. Ph. S. P.* 9 (1895) 73-.
- Radiant energy. *Golicyn, (Prince) B.* *Mosc. Un. Mm. (Ps.-Mth.)* 10 (1893) 34 pp.; *A. Ps. C.* 47 (1892) 479-; 48 (1893) 748.
- (Golicyn). *Sokolov, A. P., & Stolotov, A. G.* *Mosc. Un. Mm. (Ps.-Mth.)* 11 (1894) 69 pp.; *Fschr. Ps.* (1893) (Ab. 2) 405-.
- (—). *Schiller, N. N.* *Fschr. Ps.* (1894) (Ab. 2) 439-.
- *Gütz, H.* [1895] *Augsb. Nt. Vr. B.* (1896) 273-.
- and kinetic theory. *Bryan, G. H.* *Nt.* 57 (1897-98) 536.

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- Tyndall, J.* [1865-83] *Smiths. Rp.* (1868) 292-; *R. I. P.* 10 (1884) 253-.
- Tait, P. G.* *Edinb. R. S. P.* 12 (1884) 531-.
- Garbe, P.* *Toul. Fac. Sc. A.* 1 (1887) F, 91 pp.
- Smoluchowski, M.* *Kosmos (Lw.)* 25 (1900) 74-.
- of bodies as affected by nature of surrounding medium. *Quintus-Idilius, G. von.* *D. Nf. B.* 40 (1865) 111; *A. Ps. C.* 127 (1866) 80-.
- electromagnetic, measurement. *Boys, C. V., Briscoe, A. E., & Watson, W. L.* *Ps. S. P.* 11 (1892) 20-; *Ph. Mg.* 31 (1891) 44-.

## Heat.

(For Reflection, Refraction and Absorption of Heat Rays see 3855.)

- Poisson, S. D.* *A. C.* 26 (1824) 225-, 442-.
- Moreau de Jonnés, A.* *Quetelet Cor. Mth.* 1 (1825) 150-.
- Powell, B.* *B. A. Rp.* (1831-32) 259-.
- Talbot, W. H. F.* *Ph. Mg.* 8 (1836) 189-.
- Melloni, M.* *Bb. It.* 86 (1837) 190-; 89 (1838) 107-.

- (Melloni's researches.) *Pollet, —.* *Amiens Mm. Ac.* (1839) 207-.
- Powell, B.* *B. A. Rp.* (1840) 1-; (1854) 337-.
- Stewart, B.* *B. A. Rp.* (1859) (pt. 2) 23.
- Tyndall, J.* *Ph. Mg.* 23 (1862) 252-; *R. I. P.* 4 (1863) 146-.
- Magnus, G.* *Berl. Mb.* (1864) 593-.
- absolute measurement, method. *Ångström, K.* *Ups. S. Sc. N. Acta* 13 (1887) No. 8, 17 pp.
- apparatus. *Marbach, H.* *Bresl. Schl. Gs. Übs.* (1852) 25-.
- and chemical rays, analogies between. *Draper, J. W.* *Ph. Mg.* 19 (1841) 195-; 21 (1842) 453-.
- conditions of sensitiveness in detectors. *Pocklington, H. C.* [1899] *Camb. Ph. S. P.* 10 (1900) 66-.
- Earth's motion, possible effect. *Fizeau, H. L.* *Moigno Cosmos* 1 (1852) 689-.
- experiments. *McClure, R. J.* *Franklin I. J.* 64 (1872) 351-, 407-.
- *Fischer, K. T.* *Nt.* 62 (1900) 103-.
- isolation of long wave radiation by quartz prisms. *Rubens, H., & Aschkinass, E. A.* *Ps. C.* 67 (1899) 459-.
- in different media. *Seydler, A.* *Časopis* 2 (\*1873) 153-; *Fschr. Mth.* (\*1873) 592.
- new nomenclature (proposed). *Melloni, M. C. R.* 13 (1841) 808-; *Nap. At. Ac. Sc.* 5 (1843) 231-.
- (—) (Melloni). *Luca, F. de.* *Nap. Rd.* 1 (1842) 23-.
- passage from colder to hotter body, impossibility. *Cellérier, C.* *Gen. S. Ps. Mm. Suppl.* (1891) No. 5, 15 pp.
- perception. *Strehlke, F.* *Pogg. A.* 58 (1843) 668.
- quantitative determination, electric compensation method. *Ångström, K.* *Ups. S. Sc. N. Acta* 16 (1893) No. 6, 8 pp.
- from rough and polished surfaces. *Magnus, G.* *Berl. Mb.* (1864) 671-; *A. Ps. C.* 124 (1865) 476-.
- surfaces. *Magnus, G.* *Berl. Mb.* (1869) 713-; *A. Ps. C.* 140 (1870) 337-.
- separation from luminous and actinic rays. *Assche, F. van.* *C. R.* 97 (1833) 838-.
- from solids, limiting wave length. *Wien, W.* *A. Ps. C.* 49 (1893) 633-.
- theory. *Poisson, S. D.* *A. C.* 28 (1825) 37-.
- of the vacuum. *Gay-Lussac, L. J.* *A. C.* 13 (1820) 304-.
- (—) (Gay-Lussac). *Prevost, P. A. C.* 31 (1826) 429-.

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- Schultz, E. von.* *Götheb. Hndl.* 5 (1859) 81-.
- Tyndall, J.* *Ph. Mg.* 28 (1864) 329-.
- Ward, R. J.* *So.* 2 (1890) 680-.
- Stewart, B.* *Nt.* 32 (1885) 822-, 389, 394-, 413-, 422-, 550-; 33 (1886) 35-, 251-, 369-.
- analogies. *Powell, B.* [1852] *R. I. P.* 1 (1851-54) 172-.
- difference between. *Moser, L.* *Pogg. A.* 58 (1843) 105-.
- energy. *Crova, A.* *J. de Ps.* 7 (1878) 357-.

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- from flame. *Conroy, (Sir) J.* R. S. P. 47 (1899) 55-.
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- , *Ermerins, J. G.* Amst. Vs. Ak. 7 (1858) 81-.
- , *Abria, O.* Bordeaux Act. Ac. Sc. 27 (1865) 499-.
- , *Tyndall, J.* R. I. P. 6 (1872) 417-.
- of agents which produce, theory. *Melloni, M.* C. R. 1 (1835) 503-.
- mathematical theory. *Colnet-d'Huart, — de.* Lux. I. Ph. 21 (1891) 125-, I-.
- non-identity. *Baudrimont, A.* Bordeaux Mm. S. Sc. 3 (cah. 2) (1865) 313-.
- (*Baudrimont*). *Abria, O.* Bordeaux Mm. S. Sc. 4 (cah. 1) (1866) 77-.
- of same refrangibility, identity. *Studnička, F. J.* Wien SB. 44 (1861) (Ab. 2) 289-.
- relationships. *Martens, M.* Liège A. Ac. (1819-20) 84 pp.
- solar, separation. *Herschel, (Sir) W.* Phil. Trans. (1800) 255-.
- , — (*Herschel*). *Leslie, J.* Nicholson J. 4 (1801) 344-, 416-.
- , — (*Herschel's* researches, *Leslie's* criticisms). *Benzenberg, J. F.* Gilbert A. 10 (1802) 356-.
- , — (*Wünsch, (Prof.)*). —. Berl. Gs. Nt. Fr. Mg. 1 (1807) 185-.
- , — (*Wünsch*). *Ritter, J. W.* Gehlen J. 6 (1808) 633-.
- , — (*Herschel*). *Goethe, J. W. von* [with remarks by *Ritter, J. W.*]. Gehlen J. 6 (1808) 719-.
- , — (*Wünsch*). *Heinrich, P.* Gehlen J. 6 (1808) 729-.
- , — (*Herschel*). *Reade, J.* Tilloch Ph. Mg. 45 (1815) 422-.
- from terrestrial sources. *Powell, B.* Thomson A. Ph. 8 (1824) 81-; QJ. So. 19 (1825) 45-; Thomson A. Ph. 9 (1825) 359-, 401-.
- intensity measured by expansion of chlorine. *Richardson, A.* L. Ps. S. P. 11 (1892) 185-; Ph. Mg. 32 (1891) 277-.
- internal. *Stokes, G. G.* [1861] R. S. P. 11 (1860-62) 537-.
- invisible, combustion due to. *Tyndall, J.* [1865] R. I. P. 4 (1866) 329-.
- , of electric arc. *Tyndall, J.* R. S. P. 14 (1865) 33-.
- light, forms and sources. *Brugnatelli, L. V.* Gilbert A. 4 (1800) 438-.
- , heat and chemical radiations, identity. *Melloni, M.* C. R. 15 (1842) 454-.
- , —, —, —. *Brasack, F.* Halle Z. Nw. 25 (1865) 567-.
- due to heat and electricity, similarity. *Lacroix, —.* Fr. Cg. Sc. 28 (1861) 479-.
- , production by heat. *Draper, J. W.* Ph. Mg. 30 (1847) 345-.
- , — in theory and practice. *Brande, W. T.* (vi *Adds.*) Rm. Cor. Sc. 2 (1853) 14.
- , theory. *Soldner, J.* Gilbert A. 39 (1811) 231-.
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- prismatic, heat and light actions. *Melloni, M.* C. R. 31 (1850) 470-.
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- solar, and geologic climate. *Warring, C. B.* Science 1 (\*1883) 395, 602-.
- , —, —. *Le Conte, J.* Science 1 (\*1883) 543.
- to one sphere from another. *Meisel, F.* Z. Mth. Ps. 27 (1882) (H.-lt. Ab.) 65-.
- theory. *Prevost, P.* A. C. 6 (1817) 412-.
- , *Biot, J. B.* C. R. 8 (1839) 259-; 9 (1839) 719-.
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- , —, —. *Vierordt, K. [von].* D. C. Gs. B. 4 (1871) 327-, 457, 519; 5 (1872) 84-.
- , —, — (*Janssen*). *Champion, P., Pellet, H., & Grenier, M.* C. R. 76 (1873) 707-.
- , — (*Champion, Pellet & Grenier*). *Janssen, J.* C. R. 76 (1873) 711-.
- , —, —. *Vierordt, K. von.* A. Ps. C. 3 (1878) 357-.
- , —, —, estimation of indigo by. *Vierordt, K. von.* Fresenius Z. 17 (1878) 310-.
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- , electric. *Holtz, —.* N.-Vorp. Mt. 23 (1892) xi-.
- Vibratory energy. *Guillaume, C. É.* [1893] Arch. Sc. Ps. Nt. 31 (1894) 121-.

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- Artificial production. *Lummer, O.* Smiths. Rp. (1897) 273-.

- Artificial sources. *Abt, A.* [1878] (xii) Kolozsvár Orv.-Term. Társ. Éts. [3] (1879) (*Term. Estél.*) 31-.
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- , —, for use in spectrum analysis. *Dufour, H. Laus. S. Vd. Bl.* 29 (1893) 309-.
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- , —, *Meyer, R. Braunsch. Vr. Nt. Jbr.* (11) (1899) 26-.
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- , —, *Znatowicz's. Znatowicz, B. Kosmos (Lw.)* 20 (1895) 439-, 440.
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- , *Binder, A. Z. Nw.* 71 (1898) 435-.
- , radiation. *Le Chatelier, H., & Boudouard, O. C. R.* 126 (1898) 1861-.
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- substances. *Grönberg*, —. Riga Cor.-Bl. 27 (1884) 23.
- Indium. *Clayden*, A. W., & *Heycock*, C. T. Ph. Mg. 11 (1876) 387-.
- , blue line, wave-length. *Müller*, Joh. A. Ps. C. 124 (1865) 637-.
- Iodine. *Konen*, H. [1897] A. Ps. C. 65 (1898) 256-.
- in fused salts. *Gramont*, A. de. A. C. 10 (1897) 229-.
- , primary spectrum. *Salet*, G. C. R. 75 (1872) 76-.
- vapour, light emitted by. *Salet*, G. C. R. 74 (1872) 1249.
- Iron. *Kayser*, H., & *Runge*, C. Berl. Ak. Ab. (1888) (Anh.) No. 3, 93 pp.
- , arc spectrum. *Thalén*, R. Ups. S. Sc. N. Acta 12 (1885) No. 14, 49 pp.
- , —. *Kayser*, H. A. Ps. 3 (1900) 195-.

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- Iron, electrolytic, arc spectrum. *Lockyer*, J. N. [1893] Phil. Trans. (A) 185 (1895) 983-.
- and other metals, spectra in voltaic arc. *Secchi*, A. C. R. 77 (1873) 173-.
- meteorites, arc spectrum. *Lockyer*, J. N. [1894] Phil. Trans. (A) 185 (1895) 1023-.
- Krypton. *Ramsay*, W. [1898] Nt. 59 (1898-99) 53.
- , *Runge*, C. Asps. J. 10 (1899) 73-.
- Lanthanum, arc spectra. *Rowland*, H. A., & *Harrison*, C. N. Asps. J. 7 (1898) 373-.
- Lead. *Kayser*, H., & *Runge*, C. Berl. Ak. Ab. (1898) (Anh.) No. 3, 20 pp.
- Lithium, blue band. *Frankland*, E. Ph. Mg. 22 (1861) 472-.
- , sodium and strontium, wave-lengths. *Müller*, (Dr.) J. Pogg. A. 118 (1863) 641-.
- Magnesium. *Dewar*, J., & *Living*, G. D. R. S. P. 32 (1881) 189-; 44 (1888) 241-.
- band at  $\lambda$  5007. *Crew*, H., & *Basquin*, O. H. Asps. J. 2 (1895) 100-.
- and carbon, mathematical spectral analysis. *Grünwald*, A. Wien Ak. Sb. 96 (1888) (Ab. 2) 1154-; Mh. C. (1887) 650-.
- lithium. *Dewar*, J., & *Living*, G. D. R. S. P. 30 (1890) 93-.
- Manganese, arc spectrum. *Hasselberg*, B. [1897] Stockh. Ak. Hndl. 30 (1897-98) No. 2, 20 pp.
- and its compounds and alloys. *Hartley*, W. N. [1894] Phil. Trans. (A) 185 (1895) 1029-.
- , wave-length of fluting. *Lockyer*, J. N. R. S. P. 46 (1890) 35-.
- Mercury. *Huff*, W. B. J. H. Un. Cir. [19 (1899-1900)] 62; Asps. J. 12 (1900) 103-.
- arc. *Arons*, L. A. Ps. C. (Berl. Ps. Gs. Vh. 1892) 47 (1892) 767-.
- , flame spectrum. *Living*, G. D. Camb. Ph. S. P. 10 (1900) 38-.
- , haloid compounds, emission spectra. *Peirce*, B. O. A. Ps. C. 6 (1879) 597-.
- at various temperatures. *Eder*, J. M., & *Valenta*, E. Wien Ak. D. 61 (1894) 401-.
- Metallic compounds. *Leeds*, A. R. Franklin I. J. 60 (1870) 194-.
- , spectral lines. *Mitscherlich*, A. Par. S. C. Bil. (1862) 108-.
- halides. *Diacon*, E. (vi Add.) Mntp. Ac. Sc. Mm. 5 (1861-63) 449-.
- Metalloids. *Salet*, G. A. C. 28 (1873) 5-.
- , *Ångström*, A. J., & *Thalén*, T. R. Ups. S. Sc. N. Acta 9 (1875) (No. 9) 34 pp.
- , *Schuster*, A. Nt. 15 (1877) 447-; B. A. Rp. (1880) 258-.
- , spectroscopy. *Hasselberg*, B. St. Pét. Ac. Sc. Bil. 27 (1881) 405-.
- Metargon. *Schuster*, A. Nt. 58 (1898) 199.
- , *Ramsay*, W., *Travers*, M. W., & *Baly*, E. C. C. Nt. 58 (1898) 245-.
- , *Schuster*, A. Nt. 58 (1898) 269-.
- , *Dewar*, J. Nt. 58 (1898) 319.
- and interplanetary medium. *Rydberg*, J. R. Nt. 58 (1898) 319.
- Meteorites. *Lockyer*, J. N. [1887] R. S. P. 43 (1888) 117-.

- Minerals, anomalies in spectra and flame reactions. *Chapman, E. J.* [1889] *Cn. R. S. P. & T.* 7 (1890) (Sect. 8) 13-.
- Nickel, arc spectrum. *Hasselberg, B.* *Stockh. Ak. Hndl.* 28 (1895-96) No. 6, 44 pp.
- and cobalt, ultra-violet spectra. *Living, G. D., & Dewar, J.* *Phil. Trans. (A)* 179 (1889) 231-.
- Nitrogen. *Lecoq de Boisbaudran, —.* *C. R.* 70 (1870) 1090-.
- *Schuster, A.* *Ph. Mg.* 44 (1872) 536-.
- and alkaline metals in Geissler tubes. *Salet, G. C. R.* 82 (1876) 228-, 274-; *J. de Ps.* 5 (1876) 95-.
- , band spectrum. *Willner, A.* *Arch. Sc. Ps. Nt.* 46 (1873) 144-.
- , —, analysis. *Deslandres, H. C. R.* 101 (1885) 1256-; 103 (1886) 875-.
- , —, experiments. *Hasselberg, B.* *St. Pét. Ac. Sc. Mm.* 32 (1885) No. 15, 50 pp.
- , —, gradual transition into line spectrum. *Willner, F. H. A. A. Münch. Ak. Sb.* 9 (1879) 171-.
- , —, origin. *Hasselberg, B.* *Spet. It. Mm.* 15 (1887) 1-.
- group, bodies belonging to. *Ditte, A. C. R.* 73 (1871) 738-.
- Nonconductors, spectrum analysis. *Gramont, A. de. C. R.* 126 (1898) 1155-, 1234, 1513-; *Fr. S. Mn. Bil.* 21 (1898) 94-, 186; *Par. S. C. Bil.* 19 (1898) 742-.
- Oxygen. *Paalzow, C. A.* *Berl. Ak. Mb.* (1878) 705-.
- *Schuster, A.* [1878-79] *Phil. Trans.* 170 (1880) 37-; *A. Ps. C.* 7 (1879) 670-.
- *Willner, F. H. A. A. A. Ps. C.* 8 (1879) 253-.
- *Paalzow, C. A., & Vogel, H. W.* *A. Ps. C.* 13 (1881) 336-.
- *Janssen, J. B. A. Rp.* (1888) 547-.
- , absorption lines, construction. *Higgs, G. R. S. P.* 54 (1894) 200-.
- , line spectrum. *Eisig, M. A. Ps. C.* 51 (1894) 747-.
- , —, *Hasselberg, B. A. Ps. C.* 52 (1894) 758-.
- , nitrogen and air in liquid state, spectrum of electric discharge. *Living, G. D., & Dewar, J.* *Ph. Mg.* 88 (1894) 235-.
- , photographic observation of spectrum. *Vogel, H. W.* *Berl. B.* 12 (1879) 332-; *Berl. Ps. Gs. Vh.* (1887) 142.
- , 2 spectra. *Janssen, J.* *Leip. As. Gs. Vjschr.* 25 (1890) 2-.
- , sulphur and selenium, series spectra. *Runge, C., & Paschen, F. A. Ps. C.* 61 (1897) 641-; *Asps. J.* 8 (1898) 70-.
- , —, — (Runge & Paschen). *Schuster, A. Nt.* 57 (1897-98) 320-.
- , —, —, spectra and atomic weights. *Rummel, L.* *Vict. R. S. P.* 12 (1900) 14-.
- and thallium, new lines. *Wilde, H. C. R.* 125 (1897) 708-.
- Oxy-hydrogen blowpipe. *Hartley, W. N.* [1893] *Phil. Trans. (A)* 185 (1895) 161-; *J. de Ps.* 2 (1893) 414-.
- flame. *Living, G. D., & Dewar, J.* [1888] *Phil. Trans. (A)* 179 (1889) 27-.
- Oxy-hydrogen flame. *Eder, J. M.* *Wien Ak. D.* 57 (1890) 531-.
- Palladium, arc spectrum. *Rowland, H. A., & Tatnall, R. R.* *Asps. J.* 3 (1896) 286-.
- Phosphorus. *Beilstein, F., & Christoffe, P.* *C. R.* 56 (1863) 399-.
- *Mulder, E. J. Pr. C.* 91 (1864) 111-.
- compounds, solid. *Gramont, A. de. Par. S. C. Bil.* 19 (1898) 58-.
- in fused salts. *Gramont, A. de. C. R.* 122 (1896) 1534-; *Par. S. C. Bil.* 19 (1898) 57-.
- and silicon compounds. *Salet, G. C. R.* 73 (1871) 1056-.
- sulphur. *Séguin, J. M. C. R.* 53 (1861) 1272-.
- Platinum group, arc spectra. *Kayser, H.* *Berl. Ak. Ab.* (1897) (*Anh.*) No. 2, 44 pp.
- and osmium, arc spectra. *Rowland, H. A., & Tatnall, R. R.* *Asps. J.* 2 (1895) 184-.
- Potassium. *Freeman, J. H. C. N.* 18 (1868) 1-.
- at various temperatures. *Eder, J. M., & Valenta, E.* *Wien Ak. D.* 61 (1894) 347-.
- Praseodymium. *Forsling, S.* [1897] *Stockh. Ak. Hndl. Bh.* 23 (*Afd.* 1) (1898) No. 5, 20 pp.
- and neodymium, emission spectra. *Haitinger, L.* *Wien Ak. Sb.* 100 (1891) (*Ab. 2a*) 914-; *Mh. C.* (1891) 862-.
- , —, spectrum analysis. *Muthmann, W., & Stützel, L.* *Berl. B.* 32 (1899) 2653-.
- Radium. *Demarcay, E. C. R.* 129 (1899) 716-; 131 (1900) 258-.
- *Runge, C. A. Ps.* 2 (1900) 742-.
- in barium chloride. *Demarcay, E. C. R.* 127 (1898) 1218.
- Rare earths. *Crookes, W. B. S. P.* 40 (1886) 236-, 502-.
- , spectroscopic researches. *Crookes, W. C. S. J.* 55 (1889) 255-.
- Ruthenium, arc spectrum. *Rowland, H. A., & Tatnall, R. R.* *Asps. J.* 3 (1896) 286-.
- Salts, fused. *Gramont, A. de. C. R.* 122 (1896) 1534-; 124 (1897) 192-.
- , —, dissociation spectra. *Gramont, A. de. C. R.* 122 (1896) 1411-; *A. C.* 10 (1897) 214-; *Par. S. C. Bil.* 17 (1897) 778-, 780-; 19 (1898) 54-, 548-, 551.
- Samarium. *Lecoq de Boisbaudran, P. É. C. R.* 100 (1895) 607.
- *Demarcay, E. C. R.* 102 (1886) 1551-; 105 (1887) 276-.
- *Lecoq de Boisbaudran, —.* *C. R.* 114 (1892) 575-.
- *Demarcay, E. C. R.* 131 (1900) 995-.
- Scandium, ytterbium, erbium, thulium, brilliant lines. *Thalén, T. R. C. R.* 91 (1880) 45-, 326-, 378-.
- Selenium. *Mulder, E. J. Pr. C.* 91 (1864) 111-.
- *Ditte, A. C. R.* 73 (1871) 622-.
- and selenides. *Gramont, A. de. C. R.* 120 (1895) 778-.
- , series spectra. *Runge, C., & Paschen, F. A. Ps. C.* 61 (1897) 641-; *Asps. J.* 8 (1898) 70-.
- , — (Runge & Paschen). *Schuster, A. Nt.* 57 (1897-98) 320-.
- and tellurium. *Salet, G. C. R.* 73 (1871) 742-.

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- Silicon. *Hautefeuille, P., & Troost, L.* C. R. 78 (1871) 620-.
- *Lockyer, (Sir) N.* [1900] B. S. P. 65 (1900) 449-; 67 (1901) 408-.
- compounds. *Salet, G.* C. R. 73 (1871) 1056-.
- , emission spectrum. *Eder, J. M., & Valenta, E.* Wien Ak. D. 60 (1893) 241-.
- fluoride and silicon hydride. *Wesendonck, K. A.* Ps. C. 21 (1884) 427-.
- in fused salts. *Gramont, A. de.* C. R. 124 (1897) 192-; Par. S. C. Bll. 19 (1898) 551.
- , line spectrum. *Hartley, W. N.* B. S. P. 35 (1883) 301-.
- , —. *Eder, J. M., & Valenta, E.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 41-.
- Silver. *Kayser, H., & Runge, C.* Berl. Ak. Ab. (1892) (Anh.) No. 1, 39 pp.
- *Eder, J. M., & Valenta, E.* Wien Ak. D. 63 (1896) 189-.
- Sodium. *Lockyer, J. N.* R. S. P. 29 (1879) 140.
- *Abney, (Capt.) W. de W.* R. S. P. 32 (1881) 443-.
- burning in air, light emitted by. *Fizeau, H. L.* C. R. 54 (1862) 498-; Pogg. A. 116 (1862) 492-, 562-.
- , magnesium and aluminium, double lines. *Julius, V. A.* Amst. Ak. Vh. 26 (1888) 11 pp.; Delft Ec. Pol. A. 5 (1889) 118-.
- and potassium. *Dewar, J., & Liveing, G. D.* R. S. P. 29 (1879) 398-.
- , spectrum analysis. *Stoney, G. J.* [1891] *Dubl. S. Sc. P.* 7 (1891-92) 204-.
- at various temperatures. *Eder, J. M., & Valenta, E.* Wien Ak. D. 61 (1894) 847-.
- vapour. *Lockyer, J. N.* C. R. 88 (1879) 1124.
- in Bunsen flame. *Hastings, C. S.* [1882] *Am. As. P.* (1883) 218-.
- Strontium, arc spectrum. *Rollefson, C. J.* Ps. Rv. 11 (1900) 101-.
- Sulphur. *Mulder, E. J. Pr. C.* 91 (1864) 111-.
- *Salet, G.* C. R. 73 (1871) 559-.
- *Ditte, A.* C. R. 73 (1871) 622-.
- *Hasselberg, B.* As. & Asps. 12 (1893) 347-.
- *Eder, J. M., & Valenta, E.* Wien Ak. D. 67 (1899) 97-.
- in fused salts. *Gramont, A. de.* C. R. 122 (1896) 1326-, 1443; Par. S. C. Bll. 19 (1898) 54-.
- , line spectrum. *Rancken, E.* Fsohr. Ps. (1897) (Ab. 2) 49.
- , probable spectrum. *Ames, J. S.* As. & Asps. 12 (1893) 50-.
- , series spectra. *Runge, C., & Paschen, F. A.* Ps. C. 61 (1897) 641-; Asps. J. 8 (1898) 70-.
- , — (Runge & Paschen). *Schuster, A.* Nt. 57 (1897-98) 320-.
- Tellurium. *Ditte, A.* C. R. 73 (1871) 622-.
- Thallium. *Miller, W. A.* R. S. P. 12 (1862-63) 407-.
- *Crookes, W.* C. N. 9 (1864) 54.
- *Nichols, J.* C. R. 58 (1864) 132.

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- Thallium, new lines. *Wilde, H.* C. R. 125 (1897) 708.
- Tin. *Kayser, H., & Runge, C.* Berl. Ak. Ab. (1893) (Anh.) No. 3, 20 pp.
- and its compounds. *Salet, G.* C. R. 73 (1871) 862-.
- Titanium. *Hautefeuille, P., & Troost, L.* C. R. 73 (1871) 620-.
- , arc spectrum. *Hasselberg, B.* [1895] *Stockh. Ak. Hndl.* 28 (1895-96) No. 1, 32 pp.
- Vanadium, arc spectrum. *Rowland, H. A., & Harrison, C. N.* Asps. J. 7 (1898) 273-.
- , —. *Hasselberg, B.* [1899] *Stockh. Ak. Hndl.* 32 (1899-1900) No. 2, 88 pp.
- Water. *Dewar, J., & Liveing, G. D.* R. S. P. 30 (1880) 580-; 33 (1882) 274-.
- , luminous spectrum. *Huggins, W.* C. R. 90 (1880) 1455-.
- vapour. *Lecoq de Boisbaudran, —.* C. R. 74 (1872) 1050.
- , hydrogen and oxygen, relations of spectra. *Grünwald, A.* Wien Az. 24 (1887) 235-; C. N. 56 (1887) 186-, 201-, 223-, 232.
- Ytterbium, spectral examination. *Lecoq de Boisbaudran, P. É.* C. R. 88 (1879) 1342-.
- Yttrium earths. *Demargay, E.* C. R. 131 (1900) 387-.
- , erbium, didymium and lanthanum. *Thalén, R.* *Stockh. Ak. Hndl.* 12 (1873) No. 4, 24 pp.
- group, earths. *Soret, J. L.* C. R. 89 (1879) 621-.
- Zirconia and oxides of uranium, compounds. *Sorby, H. C.* R. S. P. 18 (1870) 197-.
- Zirconium. *Hautefeuille, P., & Troost, L.* C. R. 73 (1871) 620-.
- , arc spectra. *Rowland, H. A., & Harrison, C. N.* Asps. J. 7 (1898) 373-.

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- Salet, G.* C. R. 79 (1874) 1229-; Par. S. C. Bll. 22 (1874) 543-.
- correspondences between spectra, method of investigating. *Ramage, H.* B. A. Rp. (1900) 628-.
- formula for. *Balmer, J. J.* [1896-97] *Basel Vh.* 11 (1897) 448-.
- and intensity compared with those of hydrogen. *Cornu, A.* Par. S. Ps. Sé. (1885) 182-.
- notation. *Diacon, E.* [1867] *Mntp. Mm. Ac. Sect. Sc.* 7 (1867-71) 139-.
- periodic series, study. *Cornu, A.* C. R. 100 (1885) 1181-.
- real and accidental coincidences between lines of various spectra, method of discriminating. *Love, E. F. J.* L. Ps. S. P. 9 (1888) 94-; Ph. Mg. 25 (1888) 1-.
- — — — —. *Runge, C.* Ph. Mg. 29 (1890) 462-.
- relations between lines of various spectra. *Hartley, W. N.* Ph. Mg. 31 (1891) 359-.
- (harmonic) between different lines of substance. *Soret, J. L.* Arch. Sc. Ps. Nt. 42 (1871) 82-.
- series. *Lockyer, (Sir) N.* Nt. 60 (1899) 368-, 392-.

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- series. *Sedgwick, W.* Nt. 60 (1899) 412.  
 —. *Partridge, E. A.* Franklin I. J. 149 (1900) 193-.  
 —, law. *Thiele, T. N.* Asps. J. 6 (1897) 65-.  
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- Spectral lines, origin on wave theory of light. *Fievez, C.* Brux. Ac. Bil. 16 (1868) 81-.  
 — of solar and terrestrial origin, distinction between. *Cornu, A.* L. Ps. S. P. 8 (1887) 95-; Ph. Mg. 22 (1886) 458-.  
 — phenomena. *Wiedemann, E.* D. Nf. Vh. (1896) (Th. 2, Hälfte 1) 66.  
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 — for spectra of metallic solutions. *Delachanal, B., & Mermet, A.* C. R. 79 (1874) 800-.  
 Spectroscope, simple, teachings. *Lockyer, (Sir) N.* Nt. 59 (1898-99) 371-, 391-.  
 Spectroscopic analogies. *Zantedeschi, F.* [1868] Ven. At. 14 (1868-69) 419-.  
 — determinations. *Michelson, A. A.* Ph. Mg. 31 (1891) 338-; 34 (1892) 280-.  
 —, Michelson's. *Stoney, G. J.* Nt. 46 (1892) 513.  
 — experiments, quantitative. *Devar, J., & Liveing, G. D.* R. S. P. 29 (1879) 462-.  
 — investigations. *Ciamician, G. L.* Wien Ak. Sb. 79 (1879) (Ab. 2) 8-.  
 —. *Devar, J.* [1879] R. I. P. 9 (1882) 204-.  
 —. *Ciamician, G. L.* Wien Ak. Sb. 82 (1881) (Ab. 2) 425-.  
 — at Swedish Academy. *Hasselberg, B.* As. & Asps. 11 (1892) 793-.  
 — notes. *Leach, J. H.* Franklin I. J. 63 (1872) 418-.  
 — observations (chemical analysis by). *Bunsen, R. W., & Kirchhoff, G.* Pogg. A. 110 (1860) 160-; 113 (1861) 337-.  
 —. *Mousson, A.* Zür. Vjschr. 6 (1861) 213-.  
 —. *Secchi, A.* C. R. 76 (1878) 1052-.  
 —, Bunsen and Kirchhoff's. *Roscoe, H. E.* [1861] R. I. P. 3 (1858-62) 323-.  
 —. —. —. *Zantedeschi, F.* Ven. At. 7 (1861-62) 257-.  
 — questions. *Secchi, A.* Rm. Bil. Met. 11 (1872) 53-.  
 — researches. *Salet, G.* Par. Bil. S. C. 16 (1871) 195-.  
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 Spectroscopy, historic notes. *Zantedeschi, F.* Rm. Bil. Met. 2 (1863) 59-; Ven. At. 10 (1864-65) 1286-.

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- Spectroscopy, mensurational. *Smyth, C. P.* Nt. 22 (1890) 193-, 222-.  
 —, modern. *Schuster, A.* [1881] R. I. P. 9 (1882) 493-.

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- Wallmark, L. J.* Stockh. Öfv. 10 (1858) 71-.  
*Morren, C.* Moigno Cosmos 19 (1861) 557-.  
*Volpicelli, P.* Rm. At. 16 (1862-63) 91; C. R. 58 (1863) 493-; 57 (1863) 571-.  
*Brasack, F.* [1863] (vii) Halle Z. Nw. 23 (1864) 185-.  
*Zenger, C. W.* Živa 11 (1863) 45-, 154-.  
*Ångström, A. J.* C. R. 63 (1866) 647-.  
 (Ångström.) *Janssen, J.* C. R. 63 (1866) 728-.  
*Janssen, J.* Cosmos 2 (1868) No. 1, 1-.  
*Lecoq de Boisbaudran, —.* C. R. 69 (1869) 445-, 606-, 657-, 694-; 70 (1870) 144-, 974-; 73 (1871) 658-.  
*Tait, P. G.* Edinb. R. S. P. 7 (1872) 455-.  
*Satoczek, J.* [1873] (xii) Mag. Tud. Ak. Evk. 14 (1876) (No. 2) 41-.  
*Croulebois, M.* [1878] (xii) Doubs S. Mm. 3 (1879) 269-.  
*Auer von Welsbach, C.* Wien Az. 21 (1884) 160-.  
*Huber, G.* Bern Mt. (1891) 1-.  
*Freund, M.* Frkf. a. M. Ps. Vr. Jbr. (1898-99) 44-.
- in connection with solar spectrum. *Lockyer, J. N.* Phil. Trans. 164 (1874) 805-.  
 — — — —, hypothesis that so-called elements are compound bodies. *Lockyer, J. N.* [1878] R. S. P. 28 (1879) 157-; C. R. 86 (1879) 148-.
- of electric discharge. *Waltenhofen, A. von.* Dingler 177 (1866) 88-.
- history. *Forthomme, (Prof.) —.* (vii) Nancy Mm. Ac. Stanislas (1863) liv-.
- . *Brewster, (Sir) D.* C. R. 63 (1866) 17-.
- . *Stokes, G. G.* Nt. 13 (1876) 188-.
- . *Stewart, B.* [1879] Nt. 21 (1880) 35-.
- mathematical. *Kövesligethy, R. de.* Rs. Pa.-C. S. J. 20 (Ps.) (1868) 65-; J. de Ps. 8 (1869) 538-.
- . *Grönberg, T.* Riga Cor.-Bl. 32 (1869) 25-.
- . *Kayser, H.* C. Ztg. 13 (1889) 1655, 1687-; 14 (1890) 510-.
- 2 parameter equations. *Kövesligethy, R.* Mth. Termt. Éts. 16 (1898) 437-; Mth. Nt. B. Ung. 16 (1899) 1-.
- phenomena. *Zech, P.* Würtb. Jh. 18 (1862) 59.
- recent advances. *Ames, J. S.* Science 5 (1897) 319.
- simplified. *Laborde, (l'abbé) —.* C. R. 60 (1865) 53-.
- use of steam. *Trowbridge, J., & Sabine, W. C.* Am. J. Sc. 37 (1869) 114-.
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- Spectrum photography. *Draper, J. W.* Nt. 10 (1874) 243-.
- Terminal spectra in vacuo. *Brooks, E. E.* C. N. 64 (1891) 30-.
- Ultra-violet absorption and emission spectra. *Eder, J. M.* D. Nf. Vh. (1894) (Th. 2, Hälfte 1) 78.
- Wehnelt-break, spectroscopic observations. *Hoppe, E.* Elekttech. Z. 21 (1900) 507-.

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- Draper, H. N.* [1859] Ph. S. J. 6 (1860) 87-.
- Wills, A. W.* [1859] Ph. S. J. 6 (1860) 62-.
- Proctor, B. S.* Ph. S. J. 6 (1860) 160-.
- Bing, L.* C. N. 18 (1866) 126-.
- Holetschek, J.* Wien Ph. Cor. 15 (1878) 177-.
- Perner, J. M.* Wien Met. Z. 14 (1879) 254-401-.
- Pizzighelli, G.* Wien Ph. Cor. 18 (1881) 178-; 19 (1882) 4-, 36-, 49-, 69-, 81-, 134-, 166-, 181-, 194-, 210-, 226-, 239-, 255-, 269-; 20 (1883) 55-, 73-, 92-, 131-, 159-, 173-, 190-, 238-, 253-, 269-, 299-.
- Bartoli, A.* Catania Ac. Gioen. Bll. 16 (1891) 12-.
- Chvolson, O.* St. Pet. Ac. Sc. Mm. (Rs.) 69 (1892) (*App. No. 4*) 245 pp.; Wild Rpm. Met. 15 (1892) No. 1, viii+166 pp.
- Saveljev, R. N.* Rs. Pa.-C. S. J. 25 (Ps.) (1893) 1-; A. C. 28 (1893) 394-; 29 (1893) 260-.
- (Saveljev.) *Wild, H.* A. C. 29 (1893) 283-.
- (—) *Chvolson, O. D.* Rs. Pa.-C. S. J. 25 (Ps.) (1893) 172-; A. C. 30 (1893) 141-.
- Lemoine, G.* C. R. 120 (1895) 441-.
- Saveljev, R.* A. C. 4 (1895) 424-.
- Actinism, photographic. *La Blanchère, H. de.* A. Gén. Civ. 2 (1863) 131-.
- Actinometer (dynactinometer). *Claudet, A.* B. A. Rp. (1850) (pt. 2) 12-.
- *Woods, T.* Ph. Mg. 19 (1860) 39-.
- , chemical. *Poey, A.* Fr. S. Mét. An. 11 (\*1863) Pt. 2, 90-.
- for determining time of exposure. *Stefanowski, C. von.* Wien Ph. Cor. 14 (1877) 207-.
- , electrochemical. *Gouy, —, & Rigollet, H.* C. R. 106 (1888) 1470-.
- , —. *Rigollet, H.* Lyon Un. A. [29] (1897) 188 pp.
- , Hurter and Driffield. *Eder, J. M.* Wien Ph. Cor. 29 (1892) 396-.
- Actinometry, electro-chemical. *Maréchal, C.* Éclair. Élect. 6 (1896) 445-, 540-, 588-.
- Bunsen-Roscoe law of intermittent lighting of gelatino-bromide. *Englisch, E.* D. Nf. Vh. (1898) (Th. 2, Hälfte 1) 171-.
- Energy, photographic, and atmospheric absorption, of most refrangible light rays. *Schumann, V.* Wien Ph. Cor. 26 (1899) 218-, 280-.
- Forces, chemical, of sunlight, measurement. *Marchand, E.* A. C. 30 (1873) 302-; C. R. 76 (1873) 762-.
- , —, —, — (Marchand). *Becquerel, E.* A. C. 30 (1873) 572-.
- Heliograph. *Jordan, T. B.* Cornwall Pol. S. T. (1839) 115-.
- Intensity, chemical, of sunlight, effect of prism. *Hessler, F.* Baumgartner Z. 3 (1835) 336-.
- , —, —, —, measurement. *Roscoe, H. E.* [1860] R. I. P. 3 (1858-62) 210-.
- , —, —, —. *Phipson, T. L.* C. N. 8 (1863) 135-; C. R. 57 (1863) 601-.
- , —, —, —. *Roscoe, H. E.* R. I. P. 4 (1863) 128-.
- , —, —, —. *Dewar, J.* Edinb. R. S. P. 7 (1872) 751-.
- , —, —, —. *Thorpe, T. E.* [1874] Glasg. Ph. S. P. 9 (1875) 108-.
- , —, —, —. *Andresen, M.* Wien Ph. Cor. 35 (1898) 502-.
- of light at different angles. *Claudet, A.* B. A. Rp. (1851) (pt. 2) 45.
- — —, measurement for photographic experiments. *Heeren, F.* Pogg. A. 64 (1845) 309-.
- — — — purposes. *Lipowitz, A.* Pogg. A. 61 (1844) 140-; 63 (1844) 348-.
- Movable plates. *Haton de la Goupillière, —.* C. R. 100 (1885) 953-.
- Photo-chemical researches. (Chemical action of light, laws.) *Roscoe, H. E., & Bunsen, R. W.* B. A. Rp. (1855) (pt. 2) 48-.
- —. *Roscoe, H. E., & Bunsen, R. W.* Pogg. A. 96 (1855) 373-; B. A. Rp. (1856) 62-.
- —. (Chemical action of light, measurement.) *Roscoe, H. E., & Bunsen, R. W.* [1856] Phil. Trans. (1857) 355-.
- —. (Photo-chemical induction.) *Roscoe, H. E., & Bunsen, R. W.* Phil. Trans. (1857) 381-.

## Actinometry 4225

4225 *Sensitometry*

- Photo-chemical researches. (Photo-chemical induction.) (Roscoe & Bunsen.) *Baeyer, A.* Lieb. A. 103 (1857) 178-.
- (Chemical rays, optical and chemical extinction.) *Roscoe, H. E., & Bunsen, R. W.* Phil. Trans. (1857) 601-.
- (— action of sunlight, daylight, solar spectrum, measurement.) *Roscoe, H. E., & Bunsen, R. W.* Phil. Trans. (1859) 879-.
- (— — — — —) (Roscoe & Bunsen.) *Fonvielle, W. de.* Presse Sc. (1861) 326-.
- (— — — — —, measurement.) *Roscoe, H. E., & Bunsen, R. W.* [1862] Phil. Trans. (1863) 139-.
- Photographometer. *Claudet, A.* (vi *Adds.*) Ph. Mg. 33 (1848) 329-.
- Photometer for determination of strength of chemical rays. *Vogel, H.* [W.] A. Ps. C. 134 (1868) 146-; (xx) Berl. Ps. Gs. Vh. 1 (1882) 59-.
- , grease spot, accuracy in measurement of density of photographic plates. *Abney, (Capt.) W. de W.* S. C. In. J. 9 (1890) 722-.
- , — — — — — — — — — (Abney). *Hurter, F., & Driffield, V. C.* S. C. In. J. 9 (1890) 725.
- , — — — — — — — — —, measures. *Abney, (Capt.) W. de W.* S. C. In. J. 10 (1891) 18-.
- , — — — — — — — — —, and sector, measures. *Hurter, F., & Driffield, V. C.* S. C. In. J. 10 (1891) 20-, 98-.
- , — — — — — — — — —, *Hurter, F.* S. C. In. J. 10 (1891) 318.
- , van Monckhoven's. *Eder, J. M.* Wien Pht. Cor. 16 (1879) 218-.

*Sensitometry.*

- Plener, J.* Wien Pht. Cor. 20 (1883) 2-, 24-.
- Schwarzschild, K.* Wien Pht. Cor. 36 (1899) 398-.
- Eder, J. M.* Wien Pht. Cor. 37 (1900) 238-.
- Papers. M'Dougall, A.* [1864] C. S. J. 3 (1865) 183-.
- *Wright, C. R. A.* C. S. J. 4 (1866) 33-.
- Plates. *Eder, J. M.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 1407-; 109 (1900) (Ab. 2a) 1103-.
- , dry. *Pickering, W. H.* Am. Ac. P. 20 (1885) 159-.
- , —. *Eder, J. M.* Wien Pht. Cor. 35 (1898) 654-.
- , gelatin, testing with electric glow-lamp. *Stein, S. T.* Wien Pht. Cor. 23 (1886) 215-.
- , orthochromatic, use of Scheiner's sensitometer. *Eder, J. M.* Wien Pht. Cor. 36 (1899) 648-.
- , sensitometry of, and photochemical investigations. *Hurter, F., & Driffield, V. C.* S. C. In. J. 9 (1890) 455-.
- , — — — — — — — — — (Hurter & Driffield). *Acworth, J. J., & Acworth, (Mrs.) M. W.* Phot. J. 19 (1895) 208-.
- , — — — — — — — — — (Dr. & Mrs. Acworth). *Sterry, J.* Phot. J. 19 (1895) 288-.

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- Plates, sensitometry of, and photochemical investigations (Sterry). *Acworth, J. J., & Acworth, (Mrs.) M. W.* Phot. J. 19 (1895) 361-.
- , — — — — — — — — — (Dr. & Mrs. Acworth). *Sterry, J.* Phot. J. 19 (1895) 371-.
- , — — — — — — — — —. *Hurter, F., & Driffield, V. C.* Phot. J. 19 (1895) 372-.
- , — — — — — — — — — (Hurter & Driffield, & Sterry). *Acworth, J. J., & Acworth, (Mrs.) M. W.* [1895] Phot. J. 20 (1896) 48-.
- Sensitometer, new form. *Donkin, W. F.* Phot. J. 12 (1888) 109-.
- , and photographic plates. *Vogel, H. W.* C. Ztg. 21 (1897) 650.
- , universal. *Scheiner, J.* Z. Instk. 14 (1894) 201-.
- Sensitometers and measuring densities of photographic deposit. *Abney, (Capt.) W. de W.* Phot. J. 11 (1887) 38-.
- Transparency, photographic, of various bodies. *Miller, W. A.* Phil. Trans. (1862) 861-; R. I. P. 4 (1863) 42-.

## APPLICATIONS OF PHOTOGRAPHY.

- Tortelli, M.* N. Antol. Sc. 146 (1896) 342-, 734-.
- Air wave photography. *Mach, L.* Wien Az. 30 (1893) 198-.
- Alterations in sun's position at different times of year, determination. *Jaffé, M.* Wien Pht. Cor. 11 (1874) 153-.
- Animal locomotion, study. *Marey, E. J.* As. Fr. C. R. (1886) (Pt. 1) 53-.
- Blood corpuscles, photography, error due to images of source of light. *St. Clair, G.* [1884] Birm. Ph. S. P. 4 (1883-85) 201-.
- Cloud photography. *Angot, A.* U. S. Weath. Bur. Bl. 11 (1894) 789-.
- Discovery of forgeries. *Dennstedt, M., & Schöpf, M.* Hamb. Ws. Anst. Jb. 15 (1896) 1-.
- Drops, splash, photography. *Cole, R. S.* Nt. 50 (1894) 222-.
- of water, photography. *Lenard, P.* Nt. 42 (1890) 148.
- Electric detonators, flashes, photography. *De Grave, L. W.* I. Mn. E. T. 15 (1898) 208-; 16 (1899) 123-.
- spark, photography. *Wood, (Sir) H. T.* Phot. J. 14 (1890) 212-.
- , —, meteorological application. *Trouvelot, E. L.* As. (1889) 57-.
- Explosives, photography in technology of. *Siersch, A.* Fed. I. Mn. E. T. 11 (1896) 2-; 12 (1897) 574-; 13 (1898) 289-.
- Flying bullets, photography. *Mach, —.* Wien Pht. Cor. 21 (1884) 287-.
- , —, —. *Boys, C. V.* Phot. J. 16 (1892) 199-.
- , —, — by electric spark. *Boys, C. V.* Nt. 47 (1892-93) 415-, 440-; Un. Serv. I. J. 37 (1893) 855-.
- , —, —, Toepler's "Schlierenmethode." *König, W.* Frkf. a. M. Ps. Vr. Jbr. (1892-93) 24-.



## 4225 Lightning, Photography of

Image on retina of insect's eye, photography. *Eder, J. M.* Wien Pht. Cor. 27 (1890) 410-  
 Infinitely great and infinitely small, study of. *Olivier, L.* Rv. Sc. 3 (1882) 353-, 426-.

### Lightning, Photography of.

*Kayser, H.* Berl. Ak. Sb. (1884) 1119-.  
*Brühl, P.* A. Ps. C. 26 (1885) 334-.  
*Cazes, —.* Par. S. Ps. 86. (1885) 130.  
*Kohlrausch, —.* Würzb. Ps. Md. Sb. (1886) 28.  
*Volkmer, O.* Wien Pht. Cor. 23 (1886) 397-.  
*Jesse, O.* Met. Z. 5 (1888) 483-.  
*N., A. F.* Science 12 (1888) 11-.  
*Prinz, W.* Ciel et Terre 9 (1888-89) 337-, 525-.  
*Woods, C. R.* [1888] S. Afr. Ph. S. T. 5 (1893) 298-, 303.  
*Adams, A. J. S.* Elect. 23 (1889) 304-.  
*Piltchikoff, N.* C. R. 121 (1895) 250-.  
*Blümel, A.* Berl. Ps. Gs. Vh. (1896) 117-.  
*Glew, F. H.* Nt. 58 (1898) 627.  
*Grundmann, G.* Breal. Schl. Gs. Jbr. (1900) (Ab. 2a) 31.  
 and black sparks. *Clayden, A. W.* L. Ps. S. P. 10 (1890) 180-; Ph. Mg. 28 (1889) 92-.  
 by daylight. *Henry, A. J.* U. S. Mly. Weath. Rv. 23 (1895) 879.  
 —, application of wireless electric waves. *Glew, F. H.* Phot. J. 23 (1899) 179-.  
 with moving camera. *Weber, L.* Berl. Ak. Sb. (1889) 781-.

Mines, photography in. *Hughes, H. W.* Fed. I. Mn. E. T. 7 (1894) 164-, 353-; 8 (1895) 126.  
 Motion, photography. *Olivier, L.* Rv. Sc. 4 (1882) 302-.  
 Opaque bodies, photography. *Laforge, L.* Angers Ac. Sc. Mm. 3 (1894-95) 105-.  
 —, — through, with petroleum lamp. *Armaignac, —.* Bordeaux S. Md. Mm. (1896) 65-.  
 Optical apparatus, increase of magnification. *Seidel, L.* Münch. Sb. 2 (1861) 290-.  
 Palimpsests, photographic reconstruction. *Pringsheim, E., & Gradenwitz, —.* Berl. Ps. Gs. Vh. (1894) 58-.  
 Papyrus-rolls and monuments, use of photography for. *Eisenlohr, A.* Wien Pht. Cor. 21 (1884) 242-.  
 Photography from balloons. *Dex, L.* Rv. Sc. 50 (1892) 296-.  
 — — and railways. *Candèze, E.* Brux. Ac. Bll. 3 (1882) 468-.  
 — and coordinate surveying. *Stanley, H. M.* [1891] Am. I. Mn. E. T. 20 (1892) 740-.  
 Plans, preparation, application to. *Lavussedat, (le col.) A.* As. Fr. C. R. (1892) (Pt. 2) 215-.  
 Rapidly moving bodies, photography by oscillating sparks. *Boys, C. V.* L. Ps. S. P. 11 (1892) 1-; Ph. Mg. 30 (1890) 248-.  
 Rolling-curves, method of obtaining. *Huet, —.* C. R. 80 (1875) 380-.  
 Science, application to. *Highley, S. B. A.* Rp. (1854) (pt. 2) 69-.  
 —, —. *Meldola, R.* Essex Ntlist. 8 (1894) 39-.

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Self-luminous objects, photography, especially pyrotechnical. *Levison, W. G.* N. Y. Ac. T. 9 (1889-90) 99-.  
 Sound waves, photography. *Stein, S. T.* [1876-77] Wien Pht. Cor. 14 (1877) 133-.  
 —, —. *Boltzmann, L.* Wien Az. 19 (1882) 242-.  
 —, —. *Lloyd, R. J.* Lpool. Lt. Ph. S. P. 45 (1891) 139-.  
 —, —. *Sharpe, B. F.* U. S. Mly. Weath. Rv. 27 (1899) 205-.  
 —, — (by "Schlieren-Methode"). *Wood, R. W.* Ph. Mg. 48 (1899) 218-.  
 —, —. *Wood, R. W.* R. S. P. 66 (1900) 283-; Phot. J. 24 (1900) 250-; Nt. 62 (1900) 342-.

### Spectrum Photography.

*Wheeler, T. R.* Pht. S. J. 6 (1860) 256-.  
*Draper, J. W.* Nt. 10 (1874) 243-.  
*Hitchcock, R.* Am. As. P. (1889) 183-; Science 19 (1892) 118-.  
 Arc spectra. *Vogel, H. W.* Berl. Ps. Gs. Vh. (1889) 20.  
 —. *Baldwin, C. W.* Ps. Rv. 3 (1896) 370-, 448-.  
 Electric light. *Miller, W. A.* B. A. Rp. (1861) (Pt. 2) 87-.  
 Elements, ultra-violet spectra. *Hartley, W. N.* C. S. J. 41 (1882) 84-.  
 Gases in Geissler tubes. *Vogel, H. W.* Berl. Ak. Mb. (1879) 115-.  
 Hydrogen, second spectrum in ultra-violet. *Schumann, V.* Wien Pht. Cor. 23 (1886) 305-.  
 Infra-red spectrum, simple method of photographing. *Ångström, K.* Ups. S. Sc. N. Acta 17 (1898) No. 2, 4 pp.  
 Light of very small wave-length. *Schumann, V.* Science 20 (1892) 216-; Wien Az. 29 (1892) 230-; Wien Ak. Sb. 102 (1893) (Ab. 2a) 415-, 625-; C. N. 71 (1895) 228; Wien Az. 32 (1895) 28-, 121-; 37 (1900) 71-.  
 Lightning. *Meyer, G.* A. Ps. C. 51 (1894) 415-.  
 Metals. *Schumann, V.* C. N. 62 (1890) 299.  
 Oxygen. *Vogel, H. W.* Berl. B. 12 (1879) 332-; Berl. Ps. Gs. Vh. (1887) 142.  
 Solar spectrum, red end. *Waterhouse, (Lt.-Col.) J.* Beng. As. S. P. (1889) 154-.  
 Spark spectra. *Cazin, A.* Par. S. Phlm. Bll. 1 (1877) 6-, 94-.  
 Spectrum photography in relation to analysis. *Hartley, W. N.* Phil. Trans. 175 (1885) 49-, 325-.

Stereoscopic Röntgen pictures. *Elfström, C. O.* [1898] Sk. Nf. F. (1898) 330-; Ups. Läk. F. 4 (1899) 69-.  
 Sub-marine photography. *Regnard, —.* Par. S. Bl. Mm. 40 (1888) (C. R.) 628.  
 —. *Boutan, L.* C. R. 117 (1893) 286-; Nt. 58 (1898) 18.  
 —, —, instantaneous. *Boutan, L.* C. R. 127 (1898) 731-.

Cameras, fixed focus, sharpness of pictures obtained. *Pizzighelli, (Hptm.) —.* Wien Pht. Cor. 23 (1886) 475-.

## COLOUR PHOTOGRAPHY.

(See also Chemistry 7350, 7400.)

- Bequerel, E. C. R. 26 (1848) 181-; A. C. 22 (1848) 451-; 25 (1849) 447-.
- Niépe de Saint-Victor, A. C. R. 82 (1851) 834-; 84 (1852) 215-; 85 (1852) 694-.
- Bequerel, E. C. R. 39 (1854) 63-; A. C. 42 (1854) 81-.
- Henderson, P. [1855] Pht. S. J. 2 (1856) 122-.
- Mercer, J. B. A. Rp. (1858) (pt. 2) 57.
- Niépe de Saint-Victor, A. C. R. 54 (1862) 281-; 56 (1863) 90-; 63 (1866) 567-.
- Cros, C. Les Mondes 19 (1869) 303-.
- Saint-Florent, — de. Brux. Bl. Pht. 13 (1874) 40-, 59-, 90-.
- Ducos du Hauron, —. Brux. Bl. Pht. 13 (1874) 113-, 132-, 156-; 14 (1875) 60-, 123-, 158-, 213-; 15 (1876) 11-, 27-, 48-.
- Cros, C. C. R. 82 (1876) 1515; 83 (1876) 291-.
- (Cros.) Bequerel, E. C. R. 83 (1876) 11.
- Jaffé, M. Wien Pht. Cor. 15 (1878) 139-.
- Schnauss, J. C. Lpldina. 14 (1878) 120-.
- Carpentier, J., & Cros, C. C. R. 92 (1881) 1504-.
- Scolik, C. Wien Pht. Cor. 21 (1884) 121-, 191-, 234-, 247-.
- Vogel, H. W. A. Ps. C. 28 (1886) 130-.
- Ives, F. E. Franklin I. J. 127 (1889) 54-.
- Eder, J. M. Wien Pht. Cor. 27 (1890) 264-.
- Hürtwig, —. Magdeb. Nt. Vr. Jbr. u. Ab. (1890) 36-.
- Schnauss, J. Lpldina. 26 (1890) 203-.
- Vogel, H. W. Berl. Ps. Gs. Vh. (1890) 73-.
- Hatzfeld, A. Rv. Sc. 47 (1891) 609-.
- Ives, F. E. Franklin I. J. 131 (1891) 1-.
- Vogel, H. W. Wien Pht. Cor. 28 (1891) 551-.
- Meslin, G. A. C. 27 (1892) 369-.
- Valenta, E. Wien Pht. Cor. 29 (1892) 432-; 30 (1893) 577-.
- Pfaundler, L. Steierm. Mt. (1894) xlv-.
- Wall, E. J. Cornwall Pol. S. Rp. (1894) 93-.
- Warneke, L. [1894] Phot. J. 19 (1895) 80-.
- Neuhauss, R. Berl. Ps. Gs. Vh. (1895) 17-.
- Wiener, O. A. Ps. C. 55 (1895) 225-.
- Glan, P. A. Ps. C. 58 (1896) 402-.
- Joly, J. [1896] Dubl. S. Sc. T. 6 (1896) 127-.
- Kirbyss, O. Königsb. Schr. 37 (1896) [3]-.
- König, W. Frkf. a. M. Ps. Vr. Jbr. (1895-96) 33-.
- Wall, E. J. S. C. In. J. 15 (1896) 400-.
- Freuchen, P. N. Ts. Fs. K. 2 (1897) 337-.
- Niewenglowski, G. H. Smiths. Rp. (1898) 209-.
- Shepherd, E. S. Phot. J. 23 (1899) 316-.
- Drecker, J. [1900] Ps. Z. 2 (1901) 44-.
- Eder, —. Z. Angew. C. (1900) 1273-.
- König, —. [1900] N.-Vorp. Mt. 32 (1901) xiv-.
- Kohl, F. G. Wien Pht. Cor. 37 (1900) 602-, 650.
- Lucas, (le rév. père) —. Brux. S. Sc. A. 24 (1900) (Pt. 1) 108-.
- actino-polychrome pictures, probability of producing. Ross, W. [1854] Pht. S. J. 2 (1856) 69-.

- application of colour vision theory. Abney, (Capt.) W. de W. [1898] R. I. P. 15 (1899) 802-.
- — diffraction-grating. Wood, R. W. Ph. Mg. 47 (1899) 368-; Science 9 (1899) 859-; Phot. J. 24 (1900) 256-.
- — grating films. Thorp, T. Manch. Lt. Ph. S. Mm. & P. 44 (1900) No. 12, 8 pp.
- colour printing and relief processes. Vidal, L. A. Cons. Arts et Mét. 4 (1892) 192-.
- composite. Ives, F. E. S. C. In. J. 14 (1895) 987-.
- direct. Delvalez, L. C. R. 127 (1898) 207-.
- fixation of spectral colours. Geymet, (T.?). Brux. Bl. Pht. 13 (1874) 164-.
- Ives system. Wallich, H. Wien Pht. Cor. 31 (1894) 308-.
- Joly's method. Du Bois-Reymond, C. Berl. Ps. Gs. Vh. (1895) 73-.
- —. Sachse, J. F. Am. Ph. S. P. 35 (1896) 119-.
- —. Gibson, J. S. [1898] So. Abs. 2 (1899) 11-.
- —. Eder, J. M. Wien Pht. Cor. 36 (1899) 26-.
- —. Hinchley, J. W. S. C. In. J. 19 (1900) 5-.

## Lippmann's Interference Method.

- Lippmann, G. [1891] C. R. 112 (1891) 274-; A. Cons. Arts et Mét. 4 (1892) 161-.
- Bequerel, E. C. R. 112 (1891) 275-.
- Berget, A. Rv. Sc. 48 (1891) 33-.
- Ives, F. E. Franklin I. J. 132 (1891) 141-.
- Labatut, —. [1891] C. R. 113 (1891) 126-; Isère S. Bl. 27 (1892) 357-.
- Mancini, E. N. Antol. Sc. 115 (1891) 759-.
- Marangoni, C. Rv. Sc.-Ind. 23 (1891) 195-.
- Thwing, C. B. Am. J. Sc. 42 (1891) 388-.
- Vogel, H. W. Berl. Ps. Gs. Vh. (1891) 33-.
- Korda, D. Termt. Közl. 24 (1892) 190-.
- Krone, H. A. Ps. C. 46 (1892) 426-.
- Lippmann, G. C. R. 114 (1892) 961-; Rv. Sc. 50 (1892) 33-; C. R. 115 (1892) 575.
- Krone, H. Wien Pht. Cor. 30 (1893) 226-.
- Mareschal, G. Gén. Civ. 23 (1893) 125-.
- Sire, —. [1893] Doubs S. Mm. 8 (1894) xii-.
- Lumière, A., & Lumière, L. [1894] Lyon S. Ag. A. 2 (1895) xl-; Lyon Ac. Mm. 3 (1895) 137-.
- Léger, A. [1894] Lyon Ac. Mm. 3 (1895) 211-.
- Valenta, E. D. Nf. Vh. (1894) (Th. 2, Hälfte 1) 78-.
- Bonacini, C. Spet. It. Mm. 23 (1895) 146 (bis)-.
- Lumière, A., & Lumière, L. [1895] C. R. 120 (1895) 875-; Lyon S. Ag. A. 3 (1896) xlvi-.
- Lippmann, G. [1896] R. I. P. 15 (1899) 151-; R. S. P. 60 (1897) 10-.
- Schütt, F. A. Ps. C. 57 (1896) 533-.
- Giesel, F. Braunsch. Vr. Nt. Jbr. (10) (1897) 9-.
- Lippmann, G. [1897] Phot. J. 22 (1898) 121-.
- Vogel, H. W. Berl. Ps. Gs. Vh. (1897) 176-.
- Wiener, O. A. Ps. C. 69 (1899) 488-.

- Lüppo-Cramer*, —. *Wien Pht. Cor.* 37 (1900) 552-.
- Buss, O.* *Wien Pht. Cor.* 37 (1900) 677-, 761. and *Becquerel's. Meldola, R.* Nt. 54 (1896) 28.
- —. *Bothamley, C. H.* Nt. 54 (1896) 77.
- —. *Abney, (Capt.) W. de W.* Nt. 54 (1896) 125.
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- gallic acid. *Litppo-Cramer, —.* Wien Pht. Cor. 37 (1900) 161-.
- and gelatin-emulsions, formaldehyde-sodium bisulphite in. *Eder, J. M.* Wien Pht. Cor. 27 (1890) 105-.
- glycin  

$$\left( \text{oxyphenylglycine } C_6H_4 \begin{cases} OH \\ NH \cdot CH_2 \cdot COOH \end{cases} \right)$$
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- hydroxylamine. *David, (Lt.) L., & Scolik, C.* Wien Pht. Cor. 22 (1885) 62-.
- *Eder, J. M.* Wien Pht. Cor. 24 (1887) 363-.
- *Gothard, E. von.* Wien Pht. Cor. 24 (1887) 442-.
- *Eder, J. M.* Wien Pht. Cor. 25 (1888) 195-.
- *Konkoly, N. von.* [1888-89] Wien Ak. Sb. 97 (1889) (*Ab. 2a*) 184-; Ó-Gyalla Asps. Obs. Beob. 10 (1889) 1-.
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- , — silver-bromide-collodion plates. *Valenta, E.* Wien Pht. Cor. 34 (1897) 346-.
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- , electrotyping. *Collen, H.* [1841] L. Electr. S. P. (1843) 49-.
- , etching. *Lettsom, W. G. L.* Electr. S. P. (1843) 257-.
- , voltaic process. *Grove, W. R.* [1841] L. Electr. S. P. (1843) 94-.
- , photometric property. *Pouillet, C. S. M.* C. R. 35 (1852) 373-.
- , sensitising. *Belfield-Lefèvre,* —, & *Foucault,* L. A. C. 9 (1843) 507-.
- , — (Belfield-Lefèvre & Foucault). *Choiselat, C., & Ratel,* —. C. R. 17 (1843) 605-.
- , silver halide, action of red, orange and yellow rays. *Claudet, A. B. A. Rp.* (1848) (pt. 2) 50.
- , —, iodine film for. *Ascherson, F. M.* Pogg. A. 48 (1839) 509-.
- , —, polishing for photography. *Daguerre, L. J. M.* A. C. 7 (1843) 374-.
- , —, sensitive film. *Choiselat, C., & Ratel,* —. C. R. 17 (1843) 1070-.
- , —, —. *Daguerre, L. J. M.* A. C. 11 (1844) 189-.
- portraits of large size, difficulty of obtaining. *Breton [de Champ], P.* C. R. 39 (1854) 1174-.
- printing surface obtained from. *Berres,* — (vi *Adds.*) *Majocchi A.* Fis. C. 1 (1841) 106-.
- production. *Grütel, C. A.* Dingler 89 (1843) 423-.
- rectilinear panoramic. *Peuvion,* —. Lille Mm. S. (1850) 5-.
- different stages. *Donné, A.* C. R. 9 (1839) 376-.
- substitute for sodium hyposulphite in. *Bertoncelli, G.* (vi *Adds.*) *Majocchi A.* Fis. C. 3 (1841) 58-.
- teachings. *Waterhouse, (Maj.-Gen.) J.* [1899] Phot. J. 24 (1900) 60-.
- theory, new. *Ryan,* —. *Sturgeon A.* Electr. 9 (1842) 53-.
- and Voigtländer's camera obscura. *Reindl, J.* Dingler 86 (1842) 128-.

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- Developing and reducing power. *Bogisch, A.* Wien Pht. Cor. 37 (1900) 89-, 272-.
- Development. *Schnauss, J. C.* Lplidina. 12 (1876) 47-, 62-.
- , physics and chemistry of. *Bolas, T.* Phot. J. 19 (1895) 232-.
- , silver-gold printing by. *Farmer, E. H., & Tompkins, H. K.* Phot. J. 12 (1898) 94-.
- , theory. *Liesegang, R. E.* Wien Pht. Cor. 35 (1898) 291-.
- , —. *Andresen, M.* Wien Pht. Cor. 35 (1898) 445-.
- Dormant pictures capable of development by breath, production. *Herschel, (Sir) J. F. W.* B. A. Rp. (1843) (pt. 2) 8.
- Energiatype. *Hunt, R.* Chemist 5 (1844) 344-.
- Gelatin. *Poitevin, A.* C. R. 30 (1850) 647-; 32 (1851) 927-.
- , brominated. *Hannot, (le capit.) A.* Brux. Bll. Pht. 20 (1881) 45-.
- , silver bromide. *Chardon, A.* Wien Pht. Cor. 16 (1879) 118-.
- , —. *Monckhoven, D. van.* Wien Pht. Cor. 16 (1879) 197-.
- , —, errors. *Eder, J. M.* Wien Pht. Cor. 17 (1880) 52-.
- , —, preparation. *Monckhoven, D. van.* Brux. Bll. Pht. 18 (1879) 102-.
- , —, use of potassium bichromate. *Eder, J. M., & Pizzighelli, G.* Wien Pht. Cor. 18 (1881) 43-.
- Gum-iron processes. *Eder, J. M.* Dingler 242 (1881) 222-.
- Images on silver plate, new process. *Niépece de Saint-Victor, A.* C. R. 31 (1850) 491-.
- Intensification, experiments on new methods. *Scolik, C.* Wien Pht. Cor. 21 (1884) 265-.
- , optical effects. *Jones, C.* Phot. J. 21 (1897) 233-.
- Intensifying and colouring of carbon photographs. *Stefanowski, C. (Ritter) von.* Wien Pht. Cor. 14 (1877) 77-.
- — — — (Stefanowski). *Eder, J. M.* Wien Pht. Cor. 14 (1877) 115-.
- with lead. *Wartha, V.* Wien Pht. Cor. 14 (1877) 154-.
- — —. *Eder, J. M.* Wien Pht. Cor. 14 (1877) 172-.
- — —, new method. *Eder, J. M., & Tóth, V.* Wien Pht. Cor. 13 (1876) 10-, 206-, 221-.
- — platinum chloride. *Eder, J. M., & Tóth, V.* Wien Pht. Cor. 12 (1875) 237-.
- Metagelatin process. *Lyte, F. M.* Pht. S. J. 3 (\*1857) 223-, 253-, 287-.
- , —, Lyte's. *Fetherston, S. R.* Pht. S. J. 3 (1857) 308-.
- Photographing the invisible. *Volkmer, O.* Wien Pht. Cor. 25 (1888) 137-.
- with monochromatic light. *Abney, (Capt.) W. de W.* [1896] R. S. P. 60 (1897) 13-.
- Photography on enamel. *Duchemin, É.* C. R. 68 (1869) 88-.
- — glass. *Niépece de Saint-Victor, A. C.* R. 26 (1848) 637-.
- — —. *Groll, A.* Wien SB. (1850) (Ab. 2) 347-.

4225 *Photography on Paper*

- Photography on glass. *Niépce de Saint-Victor*,  
A. C. R. 30 (1850) 709-; 31 (1850) 245-.  
— — —. *Le Moyné, J. R.* C. R. 33 (1851)  
305-.  
— — —, method for obtaining positives.  
*Martin, Ad.* C. R. 35 (1852) 29-.  
— — —, use of starch paste. *Martin, An.*  
Wien SB. (1850) (pt. 2) 227.  
— of objects in relief and *vice versa*. *Moussard*,  
E. C. R. 128 (1896) 105.

*Photography on Paper.*

- Blanquart-Évrard*, —. A. C. 20 (1847)  
100-.  
*Saguez, G.* C. R. 25 (1847) 632-.  
*Martin, An.* Wien SB. (1848) 558-.  
*Blanquart-Évrard*, —. C. R. 29 (1849) 215-;  
30 (1850) 663-, 779.  
*Bousigues, F.* C. R. 31 (1850) 726-.  
*Bayard, H.* C. R. 32 (1851) 552-.  
*Blanquart-Évrard*, —. C. R. 32 (1851) 555-,  
639-.  
*Loo, D. J. S. van.* Batav. Ntk. Ts. 28 (1865)  
361-.  
Preparation of negative paper. *Legray, G.*  
C. R. 33 (1851) 643-.  
— — paper. *Ponton, M.* Edinb. N. Ph. J.  
27 (1859) 169-.  
Process for reproduction of engravings and  
drawings. *Becquerel, E.* C. R. 10 (1840)  
469-.  
Talbotype (photogenic drawing). *Talbot, W.*  
H. F. Ph. Mg. 14 (1839) 196-; R. S. P. 4  
(1839) 124-.  
— *Biot, J. B.* C. R. 10 (1840) 483-.  
— (question of priority). *Bayard, H.* C. R.  
12 (1841) 305-.  
— *Talbot, W. H. F.* Ph. Mg. 19 (1841)  
88-.  
— *Cundell, G. S.* Ph. Mg. 24 (1844)  
321-.  
—, collodion. *Rodger, T.* Edinb. T. Sc. S.  
Arts 4 (1856) 292-.  
—, improvements. *Lutze, G.* Dingler 119  
(1851) 434-.  
—, positive. *Brewster, (Sir) D.* B. A. Rp.  
(1845) (pt. 2) 10-.  
—, sensitive paper. *Biot, J. B.* C. R. 8 (1839)  
246-, 410-.  
— — —. *Talbot, W. H. F.* R. S. P. 4 (1839)  
134-.  
— — —, preparation. *Talbot, W. H. F.* C.  
R. 12 (1841) 1055-.  
—, simple method of manipulation. *Gray*,  
*J. J.* Beng. J. As. S. 24 (1855) 287-.  
—, sun pictures by. *Kilburn, D. T.* [1853]  
V. Diem. R. S. Pp. 2 (1852-54) 446-.
- Photo-lithographic process. *Ramsay, A. C.*  
B. A. Rp. (1855) (pt. 2) 69-.  
Positive photography. *Nipher, F. E.* St.  
Louis Ac. T. 10 (1900) lxiv-.  
— — —, especially for eclipse work. *Nipher*,  
*F. E.* St. Louis Ac. T. 10 (1900) 209-.

*Printing Processes* 4225*Printing Processes.*

- Marti, A. de.* (viii) Arnhem Ntk. 7 (1851)  
109-.  
*Oppenheim, A.* Pogg. A. 113 (1861) 308-.  
*Reynolds, J. E.* (viii) C. N. 4 (1861) 304.  
*Benecke, B.* Königsb. SB. 10 (1869) 4-.  
*Landois, H.* Bonn Cor.-Bl. NH. Vr. (1871)  
42-.  
*Angerer, C.* Wien Pht. Cor. 22 (1885) 448-.  
*Bolas, T.* Nt. 58 (1898) 204-.  
Anthrakotype. *Pizzighelli, G.* Wien Pht.  
Cor. 17 (1880) 236-, 251-.  
Apparatus for measuring light reflected from  
prints. *Jones, C.* [1896] Phot. J. 21 (1897)  
70-.  
Autotype. *Sawyer, J. R.* Brux. Bll. Pht. 14  
(1875) 95-.  
— *Schrank, L.* Wien Pht. Cor. 26 (1889)  
89-.  
—, theory. *Fruhvirth, A.* Wien Pht. Cor.  
36 (1899) 429-.  
Carbon dia-positive. *Stefanowski, C. (Ritter)*  
*von.* Wien Pht. Cor. 14 (1877) 128-.  
Catalysotype. *Woods, T.* Ir. Ac. P. 3 (1847)  
89-.  
Chemistry of printing. *Hardwich, T. F.* [1854]  
Pht. S. J. 2 (1856) 35-, 60-.  
Chromo-cyanotype. *Hunt, R.* Ph. Mg. 24  
(1844) 435-.  
Chromotype. *Hunt, R.* B. A. Rp. (1843)  
(pt. 2) 34-.  
Clouds and artistic effects, introduction.  
*Vivian, E.* B. A. Rp. (1856) (pt. 2) 18-.  
Diazotype, photographic dyeing and printing.  
*Carbutt, J.* Franklin I. J. 131 (1891) 484-.  
— process. *Andresen, M.* Wien Pht. Cor. 32  
(1895) 284-, 372.  
Direct printing of glass negatives applied to  
linear reproduction. *Brand, H.* Wien Pht.  
Cor. 15 (1878) 8-.  
Electrographic printing. *Pinaud, A.* C. R.  
17 (1843) 761-; Toul. Mm. Ac. 1 (1844) 146-.  
Electrolysotype. *Woods, T.* B. A. Rp. (1844)  
(pt. 2) 36-.  
Fading of prints. *Hardwich, T. F.* [1855-56]  
Pht. S. J. 2 (1856) 268-, 304-; 3 (1857) 12-,  
39-.  
— — —. *Lea, M. C.* Am. J. Sc. 37 (1864)  
438-.  
— — —. *Spiller, J.* Phot. J. 8 (1884) 112-.  
Gold salts, use. *Hardwich, T. F.* [1855] Pht.  
S. J. 2 (1856) 145-.  
Heliographic printing. *Courtenay, R. H.*  
Cornwall Pol. S. Rp. 38 (1870) 69.  
Heliography. [Discovery before 1827.] *Niépce*,  
*J. N.* Rv. Sc. 15 (1847) 18-.  
— on marble and lithographic stone. *Niépce*  
*de Saint-Victor, A.* C. R. 43 (1856) 874-,  
912-.  
—, new processes. *Gourdon, C.* As. Fr. C.  
R. 2 (1873) 302-; C. R. 76 (1873) 1250-.  
— on steel. *Niépce de Saint-Victor, A.* C. R.  
36 (1853) 908-; 40 (1855) 584-; 41 (1855)  
549-.  
— — — and glass. *Niépce de Saint-Victor, A.*  
C. R. 39 (1854) 618-.

- Heliography on steel plate, varnish. *Niépce de Saint-Victor*, A. C. R. 37 (1853) 667-.
- Heliogravure. *Maschek*, R. Wien Pht. Cor. 27 (1890) 245-.
- Heliotype. *Pohl*, J. J. Wien SB. 22 (1856) 291-.
- Iron salts, use. *Pizzighelli*, G. Wien Pht. Cor. 18 (1881) 69-, 85-.
- "Light printing" (photographic press-reproduction). *Albert*, A. Wien Pht. Cor. 24 (1887) 59-.
- — — *Beyersdorff*, A. Wien Pht. Cor. 28 (1891) 410-.
- Manganese salts, processes with. *Lumière*, A., & *Lumière*, L. Stockh. Öfv. (1892) 287-, 293-.
- — — (Lumière & Lumière). *Bayley*, R. C. [1893] Phot. J. 18 (1894) 130-.
- Paper, albumen, and use of albumen in photography. *Schnauss*, J. C. Wien Pht. Cor. 11 (1874) 145-, 157-, 216-.
- , albumenised. *Pujo*, —. Moigno Cosmos 18 (1861) 598-, 623-.
- , bromide, Eastman's. *Lloyd*, J. A. D. [1887] Madras J. (1887-88) 145-.
- , improved preparation. *Brooke*, C. B. A. Rp. (1849) (pt. 2) 34-.
- , positive. *Cros*, C., & *Vergeraud*, A. Par. S. Ps. Sé. (1883) 37-.
- , —, preservation. *Laborde*, (l'abbé) —. Moigno Cosmos 13 (1858) 149-.
- , —, for reproduction of engravings. *Lassaigne*, J. L. C. R. 8 (1839) 547.
- , pure, sensitiveness to light. *Liesegang*, R. E. Wien Pht. Cor. 32 (1895) 333-; 33 (1896) 53-.
- , silver chloride collodion on. *Eder*, J. M. Wien Pht. Cor. 26 (1889) 45-.
- , — — emulsion-, Just's. *Helf*, M. Wien Pht. Cor. 24 (1887) 2-.
- Photo-callographic printing. *Waterhouse*, (Capt.) J. Beng. As. S. P. (1871) 239-.
- Photo-engraving by etching and electrotyping. *Perger*, A. von. Wien SB. 24 (1857) 76-.
- , galvanography. *Pretsch*, P. [1856] Pht. S. J. 3 (1857) 58-.
- , process. *Fizeau*, H. L. Arch. de l'Électr. 6 (1844) 499-.
- processes in United States. *Suverkrop*, J. P. [1883] Sc. S. Arts T. 11 (\*1887) 70-.
- on steel. *Talbot*, W. H. F. C. R. 36 (1853) 780-.
- Photogenic drawing. *Schafhäutl* [*Pellisov*], C. E. B. A. Rp. (1840) (pt. 2) 71-.
- images and bas-reliefs of electrotypes. *Passerini*, C. (XII) Firenze Ac. Georg. At. 18 (1840) 171-.
- Photographic drawings. *Guarini*, G. Nap. Rd. 2 (1843) 423.
- reproduction by reflected light. *Boudet de Paris*, M. C. R. 102 (1886) 822-; Par. S. Ps. Sé. (1886) 118-.
- Photogravure, use of gratings ruled in squares. *Féry*, C. C. R. 120 (1895) 720-.
- Photolithographic or photozincographic prints. *Hannot*, (le capit.) A. Brux. Bll. Pht. 17 (1878) 73-.
- Photomechanical process, etc. *Tischler*, O. Königsb. Schr. 24 (1884) (Sb.) 27-.
- —, theory of screen in. *Déville*, E. Cn. R. S. P. & T. 1 (1895) (Sect. 3) 29-.
- reproduction, photolithography and heliogravure, methods. *Volkmer*, O. Wien Pht. Cor. 21 (1884) 1-.
- "Phototype." *Albert*, A. Wien Pht. Cor. 24 (1887) 59-.
- Platinotype. *Willis*, W. Phot. J. 15 (1891) 123-.
- , absorption of colouring matter by platinum. *Packham*, J. Phot. J. 19 (1895) 157-, 356-.
- deposits. *Abney*, (Capt.) W. de W. Phot. J. 12 (1888) 165-.
- , improved. *Willis*, W. Phot. J. 12 (1888) 101-.
- Platinum printing. *Putz*, M. Wien Pht. Cor. 27 (1890) 163-, 217-.
- — — *Lainer*, A. Wien Pht. Cor. 31 (1894) 518-, 566-.
- — — *Hübl*, A. (Frhr.) von. Wien Pht. Cor. 31 (1894) 553-.
- —, direct. *Pizzighelli*, G. Wien Pht. Cor. 24 (1887) 409-; 25 (1888) 1-.
- prints, changes in. *Jones*, C. Phot. J. 19 (1895) 262-.
- —, intensification. *Wall*, E. J. Phot. J. 18 (1894) 184-.
- — — — *Dollond*, A. W. Phot. J. 18 (1894) 189-.
- Positive prints (chemistry). *Davanne*, A., & *Girard*, A. [1855] Pht. S. J. 2 (1856) 201-.
- — (formation). *Girard*, A., & *Davanne*, A. C. R. 58 (1864) 634-, 699-.
- — —, direct. *Hannot*, (le capit.) A. Brux. Bll. Pht. 17 (1878) 60-.
- — with uranium oxide. *P.*, E. t. Pht. Arch. 1 (1860) 31-, 49-, 75-.
- Prussian blue prints. *Bischoff*, H. Laus. Bll. S. Vd. 5 (1857) 403-.
- Red, green, violet and blue prints. *Niépce de Saint-Victor*, A. C. R. 46 (1859) 740-.
- Reproduction of engravings, etc., by photography. *Niépce de Saint-Victor*, A. C. R. 36 (1853) 581.
- Salting, sensitising, toning and fixing baths, with specimen formulæ. *Burnett*, C. J. (vi Add.) Pht. S. J. 5 (1859) 227-, 312-.
- Siemens's regenerative gas-burners, experiments with. *Volkmer*, O. Wien Pht. Cor. 18 (1881) 5-.
- Silver chloride prints, toning. *Schnauss*, J. Pht. Arch. 2 (1861) 6-.
- prints. *Dunmore*, E. Phot. J. 8 (1884) 142-.
- salts, printing without. *Zöllner*, F. [1860] Berl. Pol. Ges. Vh. 22 (1861) 44-.
- — — — *Poitevin*, L. A. A. C. 10 (1877) 525-.
- Typographic reproduction of photographs. *Marey*, É. J. C. R. 95 (1882) 583-.
- Water colours, printing in. *Humik*, J. Wien Pht. Cor. 13 (1876) 278-.
- Sodium and potassium nitroprussides, use. *Brackenridge*, B. M. Dingler 158 (1860) 121-.

- Theory. *Monckhoven, D. van.* [1863] Pht. S. J. 8 (1864) 224-.
- Wax-paper process used in photo-meteorographic registrations, Radcliffe Observatory. *Crookes, W.* Silliman J. 23 (1856) 159-.
- Wothly's method. *Marquart, L. C.* Rheinl. Westphal. Sb. 18 (1861) 102-.
- Photographic revolver, form. *Janssen, P. J. C.* C. R. 94 (1882) 909-.
- Photographs. *Schwabe, H.* Anhalt Vh. Nt. Vr. 3 (1844) 9-.
- (supposed) by Boulton and Watt. *Sidobotham, J.* Manch. Lt. Ph. S. P. 5 (1866) 150-.
- of fluorescent substances. *Gladstone, J. H.* B. A. Rp. (1859) (pt. 2) 69.
- PHOTOGRAPHY.
- Fyfe, A.* Edinb. N. Ph. J. 27 (1859) 144-.
- Herschel, (Sir) J. F. W.* R. S. P. 4 (1839) 131-.
- Grove, W. R.* B. A. Rp. (1844) (pt. 2) 37-.
- Martin, An.* Wien SB. (1850) 11-.
- Chevreul, M. E.* C. R. 39 (1854) 391-.
- Hlasivetz, H.* Dingler 133 (1854) 118-.
- Moigno, F.* B. A. Rp. (1857) (pt. 2) 53-.
- Pretsch, P.* [1858] Pht. S. J. 5 (1859) 39-, 61-, 109-, 132-.
- Davanne, A.* Brux. Bil. Pht. 14 (1875) 10-, 26-, 43-.
- Angot, A.* Par. S. Ps. Sé. (1877) 101-.
- bearings on chemical philosophy. *Maskelyne, N. S.* B. A. Rp. (1847) (pt. 2) 56-.
- development. *Härtwig, —.* Magdeb. Nt. Vr. Jbr. u. Ab. (1890) 19-.
- and improvement. *Gottheil, —.* Königsb. Schr. 30 (1890) (Sb.) 42-.
- and graphic arts, progress. *Volkmer, O.* Wien Pht. Cor. 25 (1888) 279-, 323-; 26 (1889) 357-, 405-.
- historical and general account. *Peebles, D. B.* Sc. S. Arts T. 11 (1887) 255-.
- history. *Talbot, W. H. F.* Ph. Mg. 22 (1843) 94-.
- , processes and theory. *Moigno, F.* Rv. Sc. 14 (1847) 231-, 321-; 15 (1847) 5-.
- improvements. *Talbot, W. H. F.* R. S. P. 4 (1841) 312-.
- , *Burinskij, E.* St. Pét. Ac. Sc. Bll. 4 (1896) 315-.
- invention. *Chevreul, M. E.* J. Sav. (1873) 65-, 277-.
- inventions and applications. *Davanne, A.* A. Cons. Arts et Mét. 4 (1892) 32-.
- discoveries. *Brewster, (Sir) D.* Pht. S. J. 7 (1862) 183.
- lectures. *Malone, T. A.* [1856] Pht. S. J. 3 (1857) 136-, 158-, 203-.
- phenomena. *Brooke, C.* B. A. Rp. (1847) (pt. 2) 48.
- physics in. *Abney, (Capt.) W. de W.* Nt. 18 (1878) 489-, 528-, 543-.
- , *Buguet, A.* A. Cons. Arts et Mét. 4 (1892) 495-.
- progress. *Hitchcock, R.* N. Y. Ac. T. 1 (1881-82) 176-.
- , *Burrows, S.* Brighton NH. S. Rp. (1887) 23-.
- , *Volkmer, O.* Wien Pht. Cor. 24 (1887) 317-, 360.
- , *Ives, F. E.* Franklin I. J. 125 (1888) 345-.
- (a year's). *Schmidt, F. von.* Wien Pht. Cor. 29 (1892) 539-, 596-.
- , *J., C.* Nt. 61 (1899-1900) 416-.
- report on researches of Niépce de Saint-Victor. *Chevreul, M. E.* C. R. 25 (1847) 785-.
- Russell's contributions. *Meldola, R.* [1888] Essex Ntlist. 3 (1889) 117-.
- and technical reproduction, progress. *Volkmer, O.* Wien Pht. Cor. 23 (1886) 427-.
- theory. *Schnauss, J.* Dingler 146 (1857) 189-.
- , *Vogel, H.* Pogg. A. 119 (1863) 496-.
- , electrical. *Johnstone, —.* [1863] Pht. S. J. 8 (1864) 238-.
- and practice. *Eder, J. M.* Wien Pht. Cor. 23 (1886) 257-, 319-, 361-.
- — —, *Laussedat, (col.) A.* A. Cons. Arts et Mét. 4 (1892) 23-.
- PLATES.
- action of diffuse light during exposure. *Himley, E.* Wien Pht. Cor. 23 (1886) 606-.
- gases and metals. *Lengyel, B.* Mth. Term. Ét. 6 (1898) 365-; Mth. Nt. B. Ung. 16 (1899) 217-.
- intense luminous sources. *Baille, J. B., & Féry, C.* As. Fr. C. R. (1890) (Pt. 1) 167-; Lum. Elect. 36 (1890) 501-.
- vapours. *Muraoka, H., & Kasuya, M.* A. Ps. C. 64 (1898) 186-.
- albuminised, images on paper obtained by. *Humbert de Molard, A.* C. R. 31 (1850) 208-.
- , preparation. *Blanquart-Évrard, —.* C. R. 31 (1850) 865-.
- azalin. *Mallmann, F., & Scolik, C.* Wien Pht. Cor. 23 (1886) 331-.
- , Vogel's. *Eder, —.* Wien Pht. Cor. 21 (1884) 279-.
- celluloid films as substitute for glass. *Davis, H. S.* Science 8 (1898) 163.
- cyanine-ammonia bathed. *Mallmann, F., & Scolik, C.* Wien Pht. Cor. 23 (1886) 330-.
- dry, development. *Scolik, C.* Wien Pht. Cor. 21 (1884) 93-.
- effect of zinc and other metals. *Thomson, J. J.* [1897] Camb. Ph. S. P. 9 (1898) 372.
- erythrosin and azalin. *Vogel, H. W.* Wien Pht. Cor. 23 (1886) 393-.
- erythrosin silver, with excess of silver. *Zettnow, E., & Schumann, V.* Wien Pht. Cor. 26 (1889) 316-, 387-, 428-, 468-, 524-.
- films. *Abney, (Capt.) W. de W.* Phot. J. 22 (1898) 336-.
- fogged, experiments with. *Guébbard, A.* As. Fr. C. R. (1898) (Pt. 1) 115-; Laus. S. Vd. Bll. 34 (1898) 68-.
- ; photography of so-called human emanations. *Guébbard, A.* Rv. Sc. 8 (1897) 625-.

4225 *Photographic Plates*

- fogged; photography of so-called human emanations (Guebhard). *Baraduc, H.* Rv. Sc. 8 (1897) 752-.
- ; — — — —. *Guebhard, A.* Nt. 58 (1898) 207; Rv. Sc. 9 (1898) 75-.
- gelatin, development. *Schmid, J. F.* Wien Pht. Cor. 22 (1885) 274-.
- , —, phosphorescence during. *Eder, J. M.* Wien Pht. Cor. 24 (1887) 154-.
- , dry, manufacture. *England, J. D.* Phot. J. 17 (1893) 222-.
- emulsion-. *Schnauss, J. C.* Wien Pht. Cor. 16 (1879) 78-.
- , darkening. *Schnauss, J. C.* Wien Pht. Cor. 16 (1879) 233-.
- , exposed, utilisation. *Glissenti, C.* [1885] Phot. J. 10 (1886) 52-.
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- , effect of strength of developer. *Cartier, E. W.* [1897] Sc. Mcr. S. P. & T. 2 (1900) 149-.
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- Dutrochet, H.* C. R. 16 (1843) 610-.
- (Epipolic dispersion.) *Herschel, (Sir) J. F. W.* Phil. Trans. (1845) 143-, 147-.
- Salm-Horstmar, W. F. (Fürst zu).* Pogg. A. 88 (1853) 175-.
- Müller, (Dr.) J.* [1854] Freiburg B. 1 (1858) 49-, 97-.
- Osann, G.* Pogg. A. 94 (1855) 640-.
- Challis, J.* Ph. Mg. 12 (1856) 521-.
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- Witzschel, E. von.* Schlämilch Z. 1 (1856) 160-.
- Graulich, W. J.* Presburg Vh. 2 (1857) (Ab.) 11-.
- Guillemain, C. M.* C. R. 45 (1857) 773-.
- Akin, C. K.* B. A. Rp. (1863) 93-; Ph. Mg. 28 (1864) 554-.
- Pisko, F. J.* A. Ps. C. 123 (1864) 167-; 124 (1865) 471-.
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 Hagenbach, E. A. Ps. C. 146 (1872) 65-, 232-, 375-, 508-.
- Gripou, É. J. de Ps. 2 (1873) 199-, 246-.
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- Lubarsch, O. A. Ps. C. 153 (1874) 420-.
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- Lommel, E. C. J. Erlang. Ps. Md. S. Sb. 12 (1880) 53-.
- Lubarsch, O. A. Ps. C. 11 (1880) 46-.
- Lamansky, S. A. Ps. C. 11 (1880) 908-.
- (Lamansky.) Lubarsch, O. A. Ps. C. 14 (1881) 575-.
- Lommel, E. [1884] Münch. Ak. Sb. 14 (1885) 605-.
- Stenger, F. A. Ps. C. 28 (1886) 201-.
- Schmidt, G. C. A. Ps. C. 58 (1896) 103-.
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- , showing decomposition of molecular groups in solutions. Walter, B. A. Ps. C. 36 (1889) 518-.
- after-glow phenomena in vacuum tubes containing nitrogen. Lewis, P. Asps. J. 12 (1900) 8-; A. Ps. 2 (1900) 459-.
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- — — — — Hewitt, J. T. Z. Ps. C. 34 (1900) 1-.
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- — — — — Salvioni, E. [1896] N. Cim. 5 (1897) 63-.
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- Berthold, G. (of Ronsdorf). A. Ps. C. 158 (1876) 620-.
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- Emsmann, H. A. Ps. C. 129 (1866) 352.
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- Emsmann, H.* Pogg. A. 114 (1861) 651-.
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- Abt, A.* (xii) Orv.-Term. Éts. 5 (1880) (Nép. Előad.) 65-.
- Provenzali, F. S.* [1880] Rm. N. Linc. At. 34 (1881) 1-.
- Wiedemann, E.* [1887-88] Erlang. Ps. Md. S. Sb. 19] (1888) 25-; Arch. Sc. Ps. Nt. 18 (1887) 565-; A. Ps. C. 34 (1888) 446-.
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- (— — —) (Henry). *Becquerel, H. C. R.* 122 (1896) 791-.
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- — — — *Lumière, A., & Lumière, L. C.* B. 128 (1899) 549-.

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- Hulme, N.* Phil. Trans. (1800) 161-; (1801) 403-.
- Schäffer, J. U. G.* [1808] Erlang. Ab. 1 (1810) 471.
- Dessaigues, J. P.* J. de Ps. 68 (1809) 444-; 69 (1809) 5-.
- Heinrich, P.* J. de Ps. 74 (1812) 307-.
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 —, new cases. *Phipson, T. L. B. A. Rp. (1859) (pt. 2) 76*.  
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 —. *Osann, G. Pogg. A. 33 (1834) 405*.  
 —. *Becquerel, E. C. R. 9 (1839) 561*—, 711—; *A. C. 9 (1843) 257*—; 22 (1848) 244—; 82 (1851) 176—.  
 —, soaking in of sunlight. *Grotthus, T. von. Schweigger J. 15 (1815) 172*.  
 — light or heat, of minerals. *Becquerel, H. C. R. 112 (1891) 557*.  
 — mechanical means. *Schneider, J. Pogg. A. 96 (1855) 282*.  
 — radiation. *Heinrich, P. Schweigger J. 29 (1820) 101*.  
 — radium radiations. *Becquerel, H. C. R. 129 (1899) 912*.  
 — solar light, by electric spark and by flames of phosphorus, potassium and sodium. *Matteucci, C. Bb. Un. 40 (1842) 159*.  
 — (Matteucci). *Becquerel, E. Bb. Un. 41 (1842) 382*.  
 — (Becquerel). *Matteucci, C. Bb. Un. 42 (1842) 393*.  
 radiations which excite. *Biot, J. B. C. R. 8 (1839) 259*—, 315—.  
 —, photography by. *Zenger, C. V. C. R. 103 (1886) 454*.  
 refrangibility of active rays. *Becquerel, E. C. R. 69 (1869) 994*.  
 restored to bodies by electricity. *Dessaigues, J. P. J. de Ps. 71 (1810) 67*.  
 and spectroscopy with phosphorescent eye-piece. *Lommel, E. C. J. [1883] Münch. Ak. Sb. 13 (1884) 408*.  
 theory. *Osann, G. Oken Isis 23 (1830) 513*.  
 —. *Faltn, —. (vi Add.) Halle Jbr. NW. Vr. 5 (1852) 10*.  
 —. *Lucas, F. Les Mondes 10 (1866) 117*.  
 —. *Radziszewski, B. Berl. B. 16 (1883) 597*.  
 —. *Provenzali, F. S. Rm. N. Linc. At. 37 (1884) 189*.

PARTICULAR SUBSTANCES.

- “Bologna phosphorus,” in various gases. *Morozzo, C. L. (Conte de). Verona S. It. Mm. 3 (1786) 420*.  
 borax. *Accum, F. Nicholson J. 2 (1799) 28*.  
 calcined barium sulphate. *Daguerre, L. J. M. C. R. 8 (1839) 243*.  
 — of Daguerre, experiments. *Biot, J. B. C. R. 8 (1839) 245*.  
 calcium sulphide (violet phosphorescence). *Abney, (Capt.) W. de W. L. Ps. S. P. 5 (1884) 35*—; *Ph. Mg. 13 (1882) 212*.  
 —. *Verneuil, A. C. R. 104 (1887) 501*.  
 —. *Becquerel, E. C. R. 104 (1887) 551*.  
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 chromium oxide and gadolinite, phosphorescence on heating. *Rose, H. Berl. B. (1843) 167*.  
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 coral. *Faz, G. [1884] Padova S. Sc. At. 9 (1885) 132*.  
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 — wood. *D., J. S. (vi Add.) W. Eng. J. 1 (1836) 167*.  
 — in gases and liquids. *Böckmann, C. W. Scherer J. C. 5 (1800) 3*.  
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 —. *Riess, P. Pogg. A. 64 (1845) 334*.  
 fluorspar, etc. *Davy, (Sir) H. Nicholson J. 3 (1800) 515*.  
 —. *Brewster, (Sir) D. Edinb. Ph. J. 4 (1821) 180*.  
 —. *Marx, C. M. Schweigger J. 51 (=Jb. 21) (1827) 239*.  
 —. *Sack, A. L. Halle Jbr. NW. Vr. 4 (1851) 12*.  
 —. *Wyrouboff, —. Par. S. Ps. Sé. (1899) 72\**.  
 —. *Villard, —. Par. S. Ps. Sé. (1899) 73\**.  
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 —, glow in. *Burke, J. B. B. Elect. 45 (1900) 936*.  
 —, phosphorescence by electricity. *Becquerel, E. C. R. 48 (1869) 404*.  
 —, rarefied. *Morren, C. C. R. 53 (1861) 794*.  
 —. *Morren, A. C. R. 68 (1869) 1260*.  
 —, phosphorescence by compression. *Newall, H. F. [1897] Camb. Ph. S. P. 9 (1898) 295*.  
 —, —, — electric discharge. *Morren, A. A. C. 4 (1865) 293*—; *C. R. 68 (1869) 1033*.  
 —, —, — (Morren). *Delarive, A. C. R. 68 (1869) 1237*.  
 —, —, —. *Sarasin, É. Arch. Sc. Ps. Nt. 34 (1869) 243*.  
 —, —, — (Sarasin). *Delarive, A. A. C. 19 (1870) 191*.  
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 —, and emission of cathode rays in Crookes's tubes. *Sandrucchi, A. N. Cim. 6 (1897) 322*.  
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 inorganic chemical preparations. *Goldstein, E. Berl. Ak. Sb. (1900) 818*.  
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 limestones from Utah and India. *Lewis, H. C. Philad. Ac. Nt. Sc. P. (1884) 10*.  
 living matters, photobacteria. *Dubois, R. J. de Ps. 9 (1900) 589*.  
 luminous paint, Balmain's, radiation. *Kann, L. Ps. Rv. 8 (1899) 250*.  
 minerals. *Brewster, (Sir) D. Edinb. Ph. J. 1 (1819) 383*.

minerals under action of Röntgen rays. *Burbank, J. E.* Am. J. Sc. 5 (1898) 53-.

— phosphorescent by heat, influence of electricity. *Pearsall, T. J.* R. I. J. 1 (1881) 77-.

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— compounds. *Radziszewski, B.* C. B. 84 (1877) 305-.

— (Radziszewski). *Chevreul, M. E.* C. R. 84 (1877) 323-.

— (Chevreul). *Radziszewski, B.* C. R. 84 (1877) 656-.

— —. *Radziszewski, B.* Berl. B. 10 (1877) 321-.

— — and organised bodies. *Radziszewski, B.* Lieb. A. 203 (1880) 305-.

porcelain. *Ruspini, G.* Polli A. 20 (1855) 195-.

potassium. *Petrie, W. B. A.* Rp. (1850) (pt. 2) 59-.

quinine sulphate and valerianate. *Landerer, X.* Polli A. 28 (1859) 65.

rare earths, under cathode rays. *Swinton, A. A. C.* R. S. P. 65 (1900) 115-.

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—, coloured. *Boué, A.* Wien Sb. 59 (1869) (Ab. 2) 251-.

solid carbon dioxide. *König, W. D.* Nf. Vh. (1897) (Th. 2, Hälfte 1) 68.

strontium sulphide. *Rodríguez Mourelto, —.* Madrid S. H. Nt. A. 26 (1897) (Act.) 161-; 23 (1899) (Act.) 144-.

several sub-resins. *Bonastre, J. F.* J. Phm. 10 (1824) 193-.

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tabasheer. *Brücke, E.* (Ritter) von. [1888] Wien Ak. Sb. 97 (1889) (Ab. 1) 69-.

trees after thunder-storm. *Jobard, E.* As. (1893) 316.

*Tropæolum majus.* *Fusini, A.* A. A. Sc. Lomb. Ven. 14 (1845) 35-.

vitriolated tartar (crystallised potassium sulphate). *Giobert, G. A.* Turin Mm. Ac. 4 (1788-89) 73-.

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(See also 6840, 6845, 6850.)

Crookes's tube, photography inside. *De Metz [De Metz], G. G.* C. R. 122 (1896) 890-; 123 (1896) 354-; Rs. Ps.-C. S. J. 28 (Ps.) (1896) 81-; J. de Ps. 6 (1897) 605-.

— — — (De Metz). *Poincaré, H.* C. R. 123 (1896) 356.

— tubes, electric properties. *Ščegljajev, V.* Rs. Ps.-C. S. J. 28 (Ps.) (1896) 175-; Fachr. Ps. (1897) (Ab. 2) 708-.

Electrography (craunography), and penetration of opaque bodies by light. *Sous, —.* Bordeaux S. Md. Mm. (1896) 92-.

Hittorf tube, electric images in field of. *Oumoff, N., & Samoiloff, A.* Par. S. Ps. Sé. (1896) 177-.

Lenard-Röntgen discoveries. *Toepler, A.* Dresden Isis Sb. (1896) (Ab.) 38-.

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*Röntgen, W. C.* Würzb. Ps. Md. Sb. (1895) 132-; (1896) 11-, 17-.

*Battelli, A., & Garbasso, A.* N. Cim. 3 (1896) 40-; C. R. 122 (1896) 603.

*Salvioni, E.* N. Cim. 3 (1896) 188-.

*Martinotti, G.* N. Cim. 3 (1896) 205-.

*Campanile, F., & Stromei, E.* N. Cim. 4 (1896) 5-.

*Stefanini, A.* N. Cim. 4 (1896) 18-.

*Blaserna, P.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 1) 67-.

*Sella, A., & Majorana, Q.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 1) 116-.

*Blondin, J.* Éclair. Élect. 6 (1896) 289-.

*Taudin-Chabot, J. J.* Éclair. Élect. 7 (1896) 67-.

*Bottomley, J. T.* Glasg. Ph. S. P. 27 (1896) 156-.

*Blythswood, (Lord).* Glasg. Ph. S. P. 27 (1896) 160-.

*Macintyre, J.* Glasg. Ph. S. P. 27 (1896) 161-.

*Buti, G.* Rm. N. Linc. At. 49 (1896) 97-.

*Crespo y Martinez, G.* Méx. Obs. Bl. (1896) 99-.

*Döpke, —.* Kassel Vr. Nt. Ab. u. B. 41 (1896) xvi-.

*Dufour, H.* Par. S. Ps. Sé. (1896) 43-.

*Eccher, A.* Rv. So.-Ind. 23 (1896) 25-.

*Ettingshausen, A. von.* Steierm. Mt. (1896) xlviii-.

*Ferrini, R.* Mil. S. It. At. 36 (1896) 57-.

*Grimaldi, G. P.* Catania Ac. Gioen. Bil. 42-43 (1896) 13-.

*Henry, C.* C. R. 122 (1896) 787-.

*Houston, E. J., & Kennelly, A. E.* Franklin I. J. 141 (1896) 241-.

*Hurmuzescu, D.* [Bucarest S. So. Bl. 5 (1896)] 244-.

*Klängenberg, G.* Elekttech. Z. 17 (1896) 220-.

*Koch, —.* Würtb. Jh. 52 (1896) xoi-.

*König, —.* [1896] Z. Elektch. (1896-97) 54-.

*Lucas, J. D.* Rv. Quest. Sc. 39 (1896) 487-.

*Müller, O.* A. Ps. C. 58 (1896) 771-.

*Mützel, K.* Bresl. Schl. Gs. Jbr. (1896) (Ab. 2a) 18-.

*Murani, O.* Brescia At. Cm. (1896) 108-.

*Pupin, M. I.* Science 3 (1896) 231-.

*Lawrence, R. R.* Science 3 (1896) 409.

*Raveau, C.* Mon. Sc. 10 (1896) 161-.

*Rowland, H. A., Carmichael, N. R., & Briggs, L. J.* Am. J. Sc. 1 (1896) 247-.

*Schmidt, K. E. F.* Z. Nw. 69 (1896) 61-.

- Schuster, A.* Nt. 53 (1895-96) 268.  
*Bottomley, J. T.* Nt. 53 (1895-96) 268-.  
*Swinton, A. A. C.* Nt. 53 (1895-96) 276-.  
*Porter, A. W.* Nt. 53 (1895-96) 316.  
*Saunders, W.* Nt. 53 (1895-96) 316.  
*Blythwood, (Lord).* Nt. 53 (1895-96) 340.  
*Swinton, A. A. C.* Nt. 53 (1895-96) 340.  
*Rowland, S. D.* Nt. 53 (1895-96) 340.  
*Anon.* Nt. 53 (1895-96) 377-.  
*Swinton, A. A. C.* Nt. 53 (1895-96) 388.  
*Turner, D.* Nt. 53 (1895-96) 388.  
*Thomson, J. J.* Nt. 53 (1895-96) 391-.  
*Lodge, O. J.* Nt. 53 (1895-96) 412-.  
*Gray, A.* Nt. 53 (1895-96) 413.  
*Porter, A. W.* Nt. 53 (1895-96) 413.  
*Hicks, W. M.* Nt. 53 (1895-96) 413.  
*Gifford, J. W.* Nt. 53 (1895-96) 413-.  
*Reid, E. W., & Kuenen, J. P.* Nt. 53 (1895-96) 419.  
*Thomson, S. P.* Nt. 53 (1895-96) 437.  
*Cormack, J. D., & Ingle, H.* Nt. 53 (1895-96) 437.  
*Anon.* Nt. 53 (1895-96) 449-.  
*Reid, F. J.* Nt. 53 (1895-96) 460.  
*Gifford, J. W.* Nt. 53 (1895-96) 460-.  
*Macintyre, J.* Nt. 53 (1895-96) 461.  
*Gardiner, J. H.* Nt. 53 (1895-96) 486.  
*Anon.* Nt. 53 (1895-96) 522-.  
 (Röntgen rays and optically active substances.)  
*Frankland, P. F.* Nt. 53 (1895-96) 556-.  
*Thomson, J. J.* Nt. 53 (1895-96) 581-.  
*Anon.* Nt. 53 (1895-96) 613-.  
*Gifford, J. W.* Nt. 54 (1896) 53.  
*Rowland, —.* Nt. 54 (1896) 65.  
*Anon.* Nt. 54 (1896) 109-.  
*Thomson, J. J.* Nt. 54 (1896) 302-.  
*Anon.* Nt. 54 (1896) 354-.  
*Stokes, (Sir) G. G.* [1896] *Vict. I. J.* 30 (1898) 13-.  
*Thomson, J. J.* B. A. Rp. (1896) 699-.  
*Thomson, J. J., et alii.* *Elect.* 36 (1896) 491, et seq.; 37 (1896) 24, et seq.  
*Travers, W. T. L.* [1896] *N. Z. I. T.* 29 (1897) 118-.  
*Villari, E.* *Nap. Rd.* 35 (1896) 62-, 102-.  
*Wallon, E.* *Gén. Civ.* 28 (1895-96) 229-, 254, 286.  
*Weber, L.* [1896] *Schl.-Holst. Nt. Vr. Schr.* 11 (1898) 9-.  
*Zakrzewski, J.* *Kosmos (Lw.)* 21 (1896) 265-.  
*Zickler, C.* [1896] *Brünn Vh.* 35 (1897) (Sb.) 35-.  
*Colson, R.* A. Tél. 23 (1896-97) 97-.  
*Giesel, F.* *Braunsch. Vr. Nt. Jbr.* (10) (1897) 73-.  
*König, W.* *Frkf. a. M. Pa. Vr. Jbr.* (1896-97) 28-.  
*Mansell, T.* [1897] *Herts. NH. S. T.* 9 (1898) 135-.  
 (so-called X rays in 1708.) *Marangoni, C.* *Rv. Sc. Ind.* 29 (1897) 258-.  
*Mooser, —.* *St. Gal. B.* (1896-97) 70-.  
*Preobraženskij, P. V.* *Mosc. S. Sc. Bil.* 93 (No. 1) (1897) 17 (bis)-.  
*Röiti, A.* *Rm. R. Ac. Linc. Rd.* 6 (1897) (Sem. 1) 29-.  
*Rosenthal, J.* *Erlang. Ps. Md. S. Sb.* 28 (1897) 125-.  
*Rr. Dingler* 303 (1897) 253-.  
 (lecture.) *Thompson, S. P.* [1897] *Fachr. Röntgenstr.* 1 (1897-98) 199-.  
*Spencer, R.* *Barrow FC. Rp.* 12 (1898) 60-.  
*Valenta, E.* *Wien Ph. Cor.* 35 (1898) 251-, 309-.  
*Villari, E.* *Rm. R. Ac. Linc. Rd.* 7 (1898) (Sem. 1) 290-.  
*Malagoli, R., & Bonacini, C.* *Rm. R. Ac. Linc. Rd.* 8 (1899) (Sem. 1) 296-.  
*Lehmann, O.* *Karlsruhe Nt. Vr. Vh.* 13 (1900) (Ab.) 849-.  
 absence from sunlight. *Lea, M. C.* *Am. J. Sc.* 1 (1896) 363-.  
 — — — *Cajori, F.* *Am. J. Sc.* 2 (1896) 289-.  
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 — *Buguet, A.* *C. R.* 125 (1897) 398-.  
 — *Humphreys, W. J.* *Ph. Mg.* 44 (1897) 401-.  
 — by air. *Troubridge, J., & Burbank, J. E.* *Sc. Abs.* 2 (1899) 665.  
 — aqueous salt solutions. *Blythwood, (Lord), & Marchant, E. W.* *R. S. P.* 65 (1900) 413-.  
 — chemical compounds. *Gladstone, J. H., & Hibbert, W.* *C. N.* 78 (1898) 199-.  
 — glass. *Nannes, G.* *Stockh. Öfv.* (1896) 505-.  
 — selective. *M'Clelland, J. A.* *R. S. P.* 60 (1897) 146-.  
 actino-electric effect. *Guggenheimer, S. C.* *R.* 125 (1897) 19, 140.  
 action. *Piltchikoff, —.* *C. R.* 122 (1896) 723.  
 — *Villard, P.* *Par. S. Ps. Sé.* (1899) 18\*-.  
 — biological. *Capranica, S.* *Rm. R. Ac. Linc. Rd.* 5 (1896) (Sem. 1) 416-; 6 (1897) (Sem. 1) 38-.  
 — chemical. *Zickler, K.* *Elekttech. Z.* 17 (1896) 232.  
 — — *Hemptinne, A. de.* *Brux. Mm. Cour.* 8°, 55 (1896-98) No. 2, 36 pp.  
 — — *Villard, P.* *C. R.* 128 (1899) 237-; 129 (1899) 882-.  
 — — *Precht, J.* *Ps. Z.* 1 (1900) 48.  
 — on cooling, question. *Amerio, A.* *N. Cim.* 10 (1899) 366-.  
 — diamond. *Buguet, A., & Gascard, A.* *C. R.* 122 (1896) 457.  
 — electric. *Borgman, I. I., & Geršun, A. L.* *Rs. Pa.-C. S. J.* 28 (Ps.) (1896) 37-; *J. de Ps.* 6 (1897) 604.  
 — — *Dufour, H.* *Arch. Sc. Ps. Nt.* 1 (1896) 513-.  
 — — *Levi, G.* *Mod. S. Nt. At.* 16 (1896) 66-.  
 — of electricity on air affected by. *Villari, E.* *Nap. Rd.* 38 (1899) 145-.  
 — electrochemical, on silver bromide. *Streintz, F.* *Wien Az.* 33 (1896) 26-.  
 — on evaporation and cooling in air. *Pettinelli, P.* *N. Cim.* 8 (1898) 299-.

- action on evaporation, question. *Pasquini, E.* N. Cim. 11 (1900) 133-.
- — gaseous dielectrics. *Benoist, L.* C. R. 123 (1896) 1265-.
- — gems. *Buguet, A., & Gascard, A. C.* R. 122 (1896) 726.
- — hands. *R., S. J.* Nt. 54 (1896) 621.
- — luminescence of gases. *Hemptinne, A. de.* C. R. 125 (1897) 428-; Z. Ps. C. 26 (1898) 165-.
- — plants. *Tolomei, G.* Rm. R. Ac. Linc. Rd. 7 (1898) (Sem. 1) 81-.
- — solid and liquid insulators. *Thomson, J. J.* Nt. 55 (1896-97) 606.
- — temperature of animals. *Lecerclé, L.* C. R. 125 (1897) 284-.
- activity, method of increasing. *Garrigou, F.* C. R. 126 (1898) 1104-.
- — — — —. *Machado, V.* C. R. 126 (1898) 1341.
- and other agents, condensation nuclei produced in gases by. *Wilson, C. T. R.* [1898] Phil. Trans. (A) 192 (1899) 403-.
- as aid to scientific investigation. *Payne, E.* Brighton NH. S. Rp. (1899) 35-.
- and alternating currents. *Walter, —.* Föchr. Röntgenstr. 3 (1899-1900) 115.
- — — — —. *W.* Föchr. Röntgenstr. 3 (1899-1900) 192.
- apparatus. *Dessauer, F.* Föchr. Röntgenstr. 2 (1898-99) 150-.
- , localising. *Rémy, —.* Nt. 62 (1900) 180.
- and methods. *Willyoung, E. G., & Sayen, H. L.* Franklin I. J. 143 (1897) 211-.
- , modifications. *Macintyre, J.* [1896] Nt. 55 (1896-97) 64-.
- , new form. *Davies, B.* Nt. 54 (1896) 281-.
- , simple. *Levy, M.* Cztg. Opt. 19 (1898) 154-.
- and atmospheric electricity, cause of production. *Heen, P. de.* Brux. Ac. Bil. 31 (1896) 458-.
- Becquerel rays, action on eye. *Himstedt, F., & Nagel, W. A.* [1899] Freiburg B. 11 (1899-1901) 139-.
- — —, energy. *Rutherford, E., & McClung, R. K.* [1900] Phil. Trans. (A) 196 (1901) 25-.
- — —, enlarging and diminishing with. *Lilienstein, —.* Föchr. Röntgenstr. 3 (1899-1900) 190-.
- — —, experiments. *Himstedt, F.* [1900] Freiburg B. 11 (1899-1901) 126-.
- — — in magnetic field. *Strutt, (Hon.) R. J.* R. S. P. 66 (1900) 75-.
- — —, thermoluminescence. *Borgman, I. I.* Rs. Ps.-C. S. J. 29 (Ps.) (1897) 116-; C. R. 124 (1897) 895-.
- behaviour of luminous screens. *Precht, J. A.* Ps. 1 (1900) 420-.
- — substances at high temperatures towards. *Volta, A.* N. Cim. 8 (1898) 241-; 10 (1899) 431-.
- — sugar towards. *Wiechmann, F. G.* Science 3 (1896) 729-.
- calcium tungstate to show fluorescence, preparation. *Giazzi, F.* N. Cim. 3 (1896) 235-, 301-.
- cause. *Thomson, E.* Elect. 39 (1897) 817-.
- — —. *Wilkins, J. W.* Elect. 39 (1897) 387.
- charging of bodies by. *Nannes, G.* Stockh. Öfv. (1896) 503-.
- coin distortion by. *Cajori, F., & Strieby, W.* Science 3 (1896) 635.
- complexity. *Imbert, A., & Bertin-Sans, H.* C. R. 125 (1897) 99-.
- conductivity of air under. *Minchin, G. M.* Elect. 38 (1897) 789-.
- — — — —. *Thomson, J. J.* Elect. 38 (1897) 838.
- — — — —. *Villari, E.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 1) 343-.
- — — — —. *Campetti, A.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 2) 43-.
- convection currents and fall of potential produced by. *Zeleny, J.* [1898] Camb. Ph. S. P. 10 (1900) 14-.
- conversion of cathode rays. *Adam, G.* Sc. Abs. 1 (1898) 318.
- demonstration. *Macintyre, J.* Glasg. Ph. S. P. 28 (1897) 267-.
- “detector” for research purposes. *Trowbridge, C. C.* [1896] N. Y. Ac. T. 11 (1898) 29-.
- developments of use. *Czermak, —.* Innab. Nt. Md. B. 24 (1899) vii-.
- diagraphy with. *Brunner, M.* Föchr. Röntgenstr. 2 (1898-99) 178-.

## Diffraction.

- Bungetziano, —.* Éclair. Élect. 7 (1896) 165-.
- Calmette, L., & Lhuillier, G. T.* C. R. 122 (1896) 877-.
- Wind, C. H.* [1897-98] Amst. Ak. Vs. 5 (1897) 448-; 6 (1898) 79-; 7 (1899) 88-; Föchr. Ps. (1897) (Ab. 2) 77-; Amst. Ak. P. 1 (1899) 65-.
- Haga, H., & Wind, C. H.* Amst. Ak. Vs. 7 (1899) 500-; Amst. Ak. P. 1 (1899) 420-.
- (Haga and Wind.) *Sagnac, G.* J. de Ps. 8 (1899) 333-, 714.
- (Sagnac.) *Haga, H., & Wind, C. H.* J. de Ps. 8 (1899) 434-.
- Haga, H., & Wind, C. H.* A. Ps. C. 68 (1899) 884-.
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- — pinhole camera. *Lawrence, R. R.* Science 3 (1896) 357.
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— — —, and chemical nature of bodies, relations. *Meslans, M.* *C. R.* 122 (1898) 309-.

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—, source of rays in. *Swinton, A. A. C.* *R. S. P.* 63 (1898) 432-.

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- — —, action on electric discharge. *Sella, A., & Majorana, Q.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 1) 525-, 889-; Nt. 54 (1896) 58.
- — —, conductivity of air by. *Kelvin, (Lord), Beattie, J. C., & Smoluchowski de Smolan, M.* Edinb. R. S. P. 21 (1897) 406-.
- — — and uranium, conductivity of gases by. *Beattie, J. C., & Smoluchowski de Smolan, M.* Ph. Mg. 48 (1897) 418-.
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- — — — —. *Trowbridge, C. C.* [1896] N. Y. Ac. A. 11 (1898) 39-.
- — — — — certain phosphorescent substances for rendering visible. *Jackson, H.* C. S. P. 12 (1897) 57-.
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- — — — —. *Zeleny, J.* [1900] Phil. Trans. (A) 195 (1901) 193-.
- , measurement. *Brunhes, B.* C. R. 130 (1900) 127-.
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- visibility. *Brandes, G.* Berl. Ak. Sb. (1896) 547-.
- — — — —. *Brandes, G., & Dorn, E.* A. Ps. C. 60 (1897) 478-.
- — — — —. *Strauss, A.* Mth. Term. Ét. 15 (1897) 305-; Mth. Nt. B. Ung. 15 (1899) 1-.
- — — — —. *Dorn, E.* A. Ps. C. 64 (1898) 620-.
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- — — — — colour blind. *Dorn, E.* A. Ps. C. 66 (1898) 1171-.
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- wave-length, method of determining. *Tiddens, P. G.* Amst. Ak. Vs. 5 (1897) 444-; Fsch. Ps. (1897) (Ab. 2) 732.
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- — —, photographic action within and without. *Battelli, A.* N. Cim. 5 (1897) 169-; Ph. Mg. 43 (1897) 133-.

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- Images produced by projection from metal at high temperatures, and on a "fourth condition of matter." *Zantedeschi, F.* *Rm. Cor. Sc.* 1 (1848) 342-.
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- Le Bon, G.* *C. R.* 122 (1896) 386-.
- Briançon, A.* *C. R.* 122 (1896) 390; *Rv. Sc.* 5 (1896) 618-.
- Le Bon, G.* *C. R.* 122 (1896) 462-.
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- (Forms of energy involved in photography.) *Colson, R.* *C. R.* 122 (1896) 598-.
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- Perrigot, —.* *C. R.* 124 (1897) 857-; *Wien Pht. Cor.* 34 (1897) 271-.
- (Radiations by influence of light, electric properties.) *Le Bon, G.* *C. R.* 124 (1897) 892-; *Rv. Sc.* 7 (1897) 558-.
- (Le Bon.) *Becquerel, H.* *C. R.* 124 (1897) 984-.
- (Becquerel.) *Le Bon, G.* *C. R.* 124 (1897) 1148-; *Rv. Sc.* 7 (1897) 689-.
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- Le Bon, G.* *C. R.* 130 (1900) 891-; *Rv. Sc.* 13 (1900) 449-.
- (Le Bon.) *Curie, P.* *C. R.* 130 (1900) 1072-.
- (Curie.) *Le Bon, G.* *C. R.* 130 (1900) 1108-.
- Light, invisible. *Seckendorf, (President) —.* *Görl. Ab.* 6 (*Heft* 1) (1851) 1-.
- , new action. *Niépce de Saint-Victor, A.* *C. R.* 65 (1867) 505-.

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- Phosphorescent bodies, radiations of, passage through opaque bodies. *Niewenglowski, G. H.* *C. R.* 122 (1896) 385-.
- Photographic dry plate, action of certain substances, in dark. *Russell, W. J.* [1898] *Phot. J.* 23 (1899) 91-.
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- — — — — zinc and other metals. *Thomson, J. J.* [1897] *Camb. Ph. S. P.* 9 (1898) 372.
- Transformation of rays by different elements. *Sagnac, G.* *Éclair. Élect.* 18 (1899) 64-.
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## 4275 Radioactivity (radium, etc.).

- Becquerel, H.* *C. R.* 129 (1899) 1205-.
- Actinium. *Debiérne, A.* *C. R.* 129 (1899) 593-; 130 (1900) 906-.
- Barium. *Lengyel, B. von.* *Mth. Term. Ét.* 18 (1900) 121-; *Berl. B.* 33 (1900) 1237-.
- , artificial radio-active. *Debiérne, A.* *C. R.* 131 (1900) 333-.
- and polonium. *Giesel, F.* *Berl. B.* 33 (1900) 1665-.
- Baryta and polonium. *Giesel, F.* *A. Pa. C.* 69 (1899) 91-.
- Becquerel rays and polonium. *Curie, (Mme.) M.* *C. N.* 79 (1899) 77-.
- —, radio-activity induced by. *Curie, P., & Curie, (Mme.) M.* *C. R.* 129 (1899) 714-.
- Bismuth. *Villard, P.* *Par. S. Ps. Sé.* (1900) 59<sup>e</sup>.
- Magnetic field, effect. *Becquerel, H.* *C. R.* 129 (1899) 996-.
- Polonium. *Curie, P., Curie, (Mme.) M., & Bémont, G.* *C. R.* 127 (1898) 1215-.



## 4275 Radioactivity

- Radioactive bodies. *Hañn, E. de.* A. Ps. C. 68 (1899) 902.  
 ——. *Köhner, P.* Z. Nw. 72 (1899) 331-.  
 ——. *Curie, (Mme.) M.* Rv. Sc. 14 (1900) 65-.  
 ——. *Giesel, F.* Berl. B. 33 (1900) 8569-.  
 ——. *Sella, —.* Rv. Sc.-Ind. 32 (1900) 209.  
 ——. properties. *Becquerel, H.* C. R. 128 (1899) 771-.  
 ——. *Curie, P., & Curie, (Mme.) M.* Par. S. Ps. Sé. (1900) 10\*-.  
 ——. different radiations. *Curie, P., & Curie, (Mme.) M.* Par. S. Ps. Sé. (1900) 20\*-.  
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 ——. spectrum. *Demarçay, E.* C. R. 127 (1898) 1218.

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- Becquerel, H.* C. R. 130 (1900) 206-; Par. S. Ps. Sé. (1900) 28-.  
*Dorn, E.* C. R. 130 (1900) 1126.  
*Villard, P.* C. R. 130 (1900) 1178-.  
 absorption. *Meyer, S., & Schweidler, E. (Ritter) von.* Wien Az. 36 (1899) 351-.  
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 behaviour of radium at low temperature. *Behrendsen, O.* A. Ps. 2 (1900) 335-.  
 ——. in magnetic field. *Meyer, S., & Schweidler, E. (Ritter) von.* Wien Az. 36 (1899) 323-.  
 charge of magnetically deviable. *Curie, P., & Curie, (Mme.) M.* C. R. 130 (1900) 647-.  
 deviation in electric field. *Becquerel, H.* C. R. 130 (1900) 809-.  
 dispersion in magnetic field. *Becquerel, H.* C. R. 130 (1900) 372-.  
 passage through matter. *Becquerel, H.* C. R. 130 (1900) 979-.  
 and polonium radiation. *Giesel, F.* [1899] Braunsch. Vr. Nt. Jbr. (12) (1902) 38.  
 ——. *Meyer, S., & Schweidler, E. (Ritter) von.* Wien Ak. Sb. 109 (1900) (Ab. 2a) 92-.  
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— —, and radioactivity produced in substances by action of. *Rutherford, E.* Ph. Mg. 49 (1900) 161-.

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—, discharge due to. *Villari, E.* Nap. Rd. 36 (1897) 178-.

—, and thorium compounds, radiations. *Curie, (Mme.) M.* C. R. 126 (1898) 1101-.

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— radium, and other metallic emanations. *Le Bon, G.* Rv. Sc. 13 (1900) 548-.

rays. *Becquerel, H.* [1898-1900] C. R. 122 (1896) 1086-; 130 (1900) 1583-; 131 (1900) 137-; Sc. Abs. 4 (1901) 1025.

— *Crookes, (Sir) W.* R. S. P. 66 (1900) 409-.

—, discharge of conductors by. *Becquerel, H.* C. R. 124 (1897) 438-.

—, effect on condensation of water vapour. *Wilson, C. T. R.* [1897] Camb. Ph. S. P. 9 (1898) 333-.

—, and electric conduction produced by them. *Rutherford, E.* Ph. Mg. 47 (1899) 109-.

—, electrification of air by. *Beattie, J. C.* Edinb. R. S. P. 21 (1897) 466-.

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—, fluorescence produced by. *Spies, P.* Berl. Ps. Gs. Vh. (1896) 101.

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salts, and Crookes's tube, differences between radiations. *Becquerel, H.* C. R. 122 (1896) 762-.

—, invisible radiations. *Becquerel, H.* C. R. 122 (1896) 689-.

—, — (Becquerel). *Troost, L.* C. R. 122 (1896) 694.

—, radiation. *Becquerel, H.* C. R. 123 (1896) 855-.

—, —, Becquerel's experiments. *Sagnac, G.* J. de Ps. 5 (1896) 193-.

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- Images formed by vision, and reproduced by photography. *Zantedeschi, F.* *Ven. At.* 10 (1864-65) 913-.
- Interferences observed on viewing one coarse grating through another, and projection of one piece of wire gauze by a parallel piece. *Barus, C.* *Science* 12 (1900) 617-.
- Inversion in telescopes. *Marangoni, C.* *Rv. Sc.-Ind.* 17 (1885) 347-.
- Laws. *Scheffler, H.* *Halle Z. Nw.* 27 (1866) 325-.
- Light. *Dwight, T.* *Conn. Mm. Ac.* 1 (1810) 387-.
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- *Volger, G. H. O.* *Emden Nf. Ga. Jbr.* (1890-91) xiv + 177 pp.
- , amount entering eye from luminous object. *Schultén, N. G. af (fil.).* [1823] *St. Pét. Mm. Sav. Étr.* 1 (1831) 89-.
- , colour, and form. *Henry, C.* *Rv. Sc.* 46 (1890) 289-, 364-.
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- , properties of impressions produced by. *Plateau, J. A. F.* *Pogg. A.* 20 (1830) 304-.
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- Luminous appearance which some have seen round the shadow of their head. *Winterfeld, A. von.* *Gilbert A.* 18 (1804) 57-.
- Ocular pressure and tension, physical studies. *Gruber, R.* *Arch. Augenh.* 33 (1896) (*Festschr.*) 69-; 35 (1897) 59-.
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- , Libri's. *Beer, A.* *Pogg. A.* 87 (1852) 115-.
- experiments. *Lipkens, —.* *Quetelet Cor. Mth.* 4 (1828) 244-.
- *Hyslop, J. H.* *Science* 11 (1888) 217-.
- (Hyslop). *Le Conte, J.* *Science* 11 (1888) 252.
- *Canestrini, E.* *Padova S. Sc. At.* 11 (1889) 224-.

### OPTICAL ILLUSIONS.

- Wilcocks, A.* *Philad. Ac. Nt. Sc. P.* (1858) 19-.
- Landerer, J.* *Les Mondes* 11 (1866) 9-.
- Tupper, J. L.* *Ph. Mg.* 39 (1870) 423-.

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- Thompson, S. P. B. A. Rp.* (1877) (*Sect.*) 32; *J. Sc.* 1 (1879) 234-.
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- Fritz, G.* *Wien Ph. Cor.* 28 (1891) 501-, 555-.
- Bode, P.* *Frkf. a. M. Ps. Vr. Jbr.* (1891-92) 32-.
- Delbœuf, J.* *Brux. Ac. Bll.* 24 (1892) 545-.
- Bourdon, —.* *Rv. Sc.* 51 (1893) 668.
- Brunot, C.* *Rv. Sc.* 52 (1893) 210-.
- Sanford, E. C.* *Science* 21 (1893) 92-.
- Javal, É.* *Par. S. Ps. Sé.* (1895) 271-.
- Franklin, (Mrs.) C. L.* *Science* 3 (1896) 274-.
- Baldwin, J. M.* *Science* 4 (1896) 794-.
- Meslin, G.* *Par. S. Ps. Sé.* (1897) 55-.
- Guillaume, C. É.* *Par. S. Ps. Sé.* (1899) 2\*-.
- Wyczółkowska, A.* [1899] *Krk. Ak. (Mt. Prz.) Rz.* 18 (1901) 160-; *Cro. Ac. Sc. Bll.* (1900) 7-.
- accompanying formation of penumbras, application to X rays. *Sagnac, G.* *Par. S. Ps. Sé.* (1897) 9-.
- in appearance of geometrical figures. *Holtz, W. A. Ps. C.* 10 (1880) 158-.
- geometrical. *Thiéry, A.* *Ph. Stud.* 11 (1895) 307-, 603-; 12 (1896) 67-.
- *Pierce, A. H.* *Science* 8 (1898) 814-.
- *Wundt, W.* *Leip. Mth. Pa. Ab.* 24 (1898) 53-.
- (Wundt). *Heymans, G.* *Ph. Stud.* 13 (1898) 613-.
- (Heymans). *Wundt, W.* *Ph. Stud.* 13 (1898) 616-.
- *Keferstein, —.* [1899] *Lüneb. Nt. Vr. Jh.* 15 (1901) xxvii-.
- increased distance of objects. *Hueck, A. Müller Arch.* (1840) 76-.
- intermittent. *Ott, G.* *Bern Mt.* (1868) 70-.
- laws. *Preobraženskij, P. V.* *Mosc. S. Sc. Bll.* 91 (No. 2) (1895) 46-.
- Mach's explanation. *Sommer, J.* *Časopis* 20 (1891) 101-; *Fachr. Ps.* (1891) (Ab. 2) 195.
- maxima and minima of apparent brightness resulting from. *Wind, C. H.* [1896] *Amst. Ak. Vs.* 7 (1899) 12-; *Amst. Ak. P.* 1 (1899) 7-.
- of motion. *Dove, H. W.* *Berl. Mb.* (1865) 129-.
- *Thompson, S. P.* [1880] (xii) *Brain* 3 (1881) 289-.
- produced by curve-tracing top. *Warring, C. B.* *Science* 4 (1896) 533-.
- — dædaleum. *Hornor, W. G.* *Ph. Mg.* 4 (1834) 36-.
- — drawing and painting. *Soret, J. L.* *Arch. Sc. Ps. Nt.* 20 (1888) 368-.
- — electric fan. *Kenyon, F. C.* *Science* 8 (1898) 371-.
- — light. *Hefner-Alteneck, F. von.* *Berl. Ps. Gs. Vh.* (1897) 72-.
- — observation of rotating spirals. *Grünbaum, O. F. F.* *Nt.* 57 (1897-98) 271.
- — Ritchie's horizontal artificial voltaic magnet. *Tomlinson, C.* *Sturgeon A. Electr.* 1 (1836-37) 108-.
- — stroboscopic discs. *Stampfer, S.* *Wien Jb. Pol. I.* 18 (1834) 237-.

produced by stroboscopic discs. *Rollmann, W.*  
*Psychol.* 16 (1898) 246-.  
 — — Welsbach light. *Loring, F. H.* *Nt.* 54  
 (1896) 248.  
 pseudoscopic and optometric figure. *Emsmann,*  
*H. A.* *Ps. C.* 141 (1870) 476-.  
 "third wheel." *Rateau, A.* [1892] *Gén. Civ.*  
 22 (1892-93) 125-.  
 windmill. *Pierce, A. H.* *Science* 8 (1898) 479-.  
 —. *Le Conte, J.* *Science* 8 (1898) 490-.

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*Schrank, F. von P. von.* *Wet. Gs. N. A.* 1  
 (1819) 147-.  
*Stokes, J.* (vi *Adds.*) *Ph. Mg.* 6 (1829)  
 416-.  
*Plateau, J. A. F.* *Quetelet Cor. Mth.* 7 (1832)  
 288-; *Brux. Ac. Bil.* 1 (1832-34) 195-.  
*Powell, B.* [1833-34] *Ashmol. S. P.* 1 (1844)  
*No. 2, 3-, No. 4, 1-.*  
*Acqua, A. dall', & Cataneo, F.* *Omodei A. Un.*  
 72 (1834) 227-.  
*Kater, H.* (vi *Adds.*) *Ph. Mg.* 5 (1834)  
 375-.  
*Crahay, J. G.* *Brux. Ac. Bil.* 2 (1835) 76-.  
*Brewster, (Sir) D.* (vi *Adds.*) *Majocchi A.*  
*Fis. C.* 16 (1844) 24-.  
*Marangoni, C.* *N. Cim.* 27 (\*1868) 22-.  
*Mallock, A.* *Nt.* 14 (1876) 350-.  
*Airy, H.* *Nt.* 14 (1876) 392, 525-.  
*Backhouse, T. W.* *Nt.* 14 (1876) 474.  
*Biden, H. B.* *Nt.* 14 (1876) 525.  
*Ricciò, A.* *Mod. Ac. Sc. Mm.* 17 (1877) 239-.  
*Trève, (capit.) A. R. S.* *C. R.* 91 (1880) 893;  
 92 (1881) 522-.  
*S., F. J.* *Science* 3 (1884) 275, 475.  
*Le Conte, J.* *Science* 3 (1884) 404, 644.  
*Oliver, J. E.* *Science* 3 (1884) 475, 563.  
*Hastings, C. S.* *Science* 3 (1884) 501-.  
*Herschel, J.* *Science* 3 (1884) 704.  
*Tchiriew, S.* *C. R.* 119 (1894) 915-.  
*Warring, C. B.* *Nt.* 55 (1896-97) 232.  
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*Mm. Ac. Ag.* 20 (1842) 53-.  
 after microscopic work. *Leroy, C. J. A.* *C. R.*  
 108 (1869) 1271-.  
 — — —. *Landerer, J. J.* *C. R.* 109 (1889)  
 74-.  
 moving photographic figures. *Claudet, A. F. J.*  
*Ph. Mg.* 30 (1865) 271-.  
 observed on railways. *Parrot, G. F.* [1839]  
*St. Pét. Ac. Sc. Bil.* 6 (1840) 138-.  
 projection of shadows on fogs and volcanic  
 vapours. *Omalius d'Halloy, J. B. J.* *Par.*  
*S. Phlm. Bil.* 2 (1810) 159-.  
 subjective. *Oppel, J. J.* *Pogg. A.* 118 (1863)  
 480-.  
 —. *König, A.* *Berl. Ps. Gs. Vh.* (1884) 40-;  
*Arch. f. Oph.* 30 (1884) (*Ab.* 3) 329-.  
 —. *Millar, W. J.* *Nt.* 60 (1899) 391.  
 —, on gazing at contours. *Mayerhausen, G.*  
*Arch. f. Oph.* 30 (1884) (*Ab.* 2) 191-, (*Ab.* 4)  
 311-.  
 — phenomena, analytic bibliography. *Plateau,*  
*J.* [1833] *Brux. Ac. Mm.* 45 (\*1884) (*No.* 4)  
 20 pp.

Optics of ancient Greeks. *Hirschberg, J. Z.*  
*Psychol.* 16 (1898) 321-.  
 Panorama. *Chevreul, M. E.* *C. R.* 61 (1865)  
 670-.  
 Photometric standard. *Nicati, —.* *As. Fr.*  
*C. R.* (1891) (*Pt.* 2) 310-.  
 Physics and aesthetics, inter-relationships.  
*Soret, J. L.* *Sch. Nf. Gs. Vh.* (1885-86) 1-.  
 Radiant spectrum. *Tait, P. G.* [1867] *Edinb.*  
*R. S. P.* 6 (1869) 167.  
 Rapidly rotating disks, action of flashes of  
 light. *Tomlinson, C.* [1835] *Thomson Rc.*  
 3 (1836) 41-.  
 — — —, curved figures produced by. *Tomlin-*  
*son, C.* *Thomson Rc.* 4 (1836) 135-.  
 — — mirror, curves produced by. *Anderson, A.*  
*Edinb. N. Ph. J.* 40 (1846) 59-.  
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*C. H.* *Science* 7 (1896) 425-.  
 — —, theory of formation. *Gal, J.* *Nim. S.*  
*Sc. Bil.* (1893) liii-.  
 Sensation of motion and its reversal. *Franklin,*  
*W. S.* *Science* 9 (1899) 70-.  
 Talbot's law, theory. *Marbe, K.* *Ph. Stud.* 12  
 (1896) 279-.  
 Ultra-violet rays, protection of eye from.  
*Schulek, V.* *Mth. Term. États.* 17 (1899)  
 510-; *Mth. Nt. B. Ung.* 17 (1901) 341.  
 Visible direction, Brewster's supposed law.  
*Young, G. P.* *Cn. J.* 2 (1857) 268-.

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*Walker, Ez.* *Tilloch Ph. Mg.* 31 (1808) 126-.  
*Horn, A.* *Tilloch Ph. Mg.* 48 (1816) 117-.  
 (Horn.) *Pater, W.* *Tilloch Ph. Mg.* 48 (1816)  
 353-.  
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 26-.  
*Dunglison, R.* *Thomson A. Ph.* 10 (1817)  
 432-.  
*Lehot, C. J.* *Brugnatelli G.* 5 (1822) 161-.  
*Joslin, B. F.* *Am. J. Md. Sc.* 8 (1831) 100-.  
*Aimé, G.* *Eure S. Ag. Rec.* 5 (1834) 445-.  
*Sturm, J. C. F.* *C. R.* 20 (1845) 1238-.  
*Reuschle, C. G.* *Würtb. Jh.* 24 (1868) 51-.  
*Laugier, A.* *C. R.* 97 (1833) 1516-.  
 (Laugier.) *Chevreul, M. E.* *C. R.* 97 (1833)  
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 and action of light on all bodies. *Moser, L.*  
*Pogg. A.* 56 (1842) 177-.  
 amount of time necessary. *Rood, O. N.* *Am.*  
*J. Sc.* 2 (1871) 159-.  
 indirect, and metallic lustre. *Kirschmann, A.*  
*Ph. Stud.* 11 (1895) 147-.  
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 molecular vibrations and ether waves in. *Favé,*  
*L.* *C. R.* 86 (1878) 441-.  
 with optical instruments. *Kiessling, J.* *Hamb.*  
*Mth. Gs. Mt.* 2 (1890) (*Festschr., Tl.* 2) 125-.  
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 207-.  
 —. *Reade, J.* *Tilloch Ph. Mg.* 54 (1819) 49-.  
 —. *Lehot, C. J.* *Brugnatelli G.* 7 (1824) 290-.  
 —. *Avon.* (vi 557) *Gergonne A. Mth.* 15  
 (1824-25) 364-.

- theory. *Grimaldi, G.* [1829] *Lucca At. Ac.* 6 (1830) 69-.
- , *Crahay, J. G.* *Brux. Ac. Bil.* 12 (1845) (pte. 2) 311-.
- , *Sturm, J. C. F.* *C. R.* 20 (1845) 554-, 761-; *Pogg. A.* 65 (1845) 116-, 374-.
- , *Trouessart, —.* *C. R.* 35 (1852) 134-; 36 (1853) 144-, 227.
- , *Uribe Troncoso, M.* *Méx. S. "Alzate"* *Mm.* 14 (1899) 145-.
- , mathematical. *Lucas, F.* *Les Mondes* 9 (1866) 546-.
- under water. *Horsburgh, J.* *Nicholson J.* 15 (1806) 265-.
- , *Muncke, G. W.* *Pogg. A.* 2 (1824) 257-.
- , *Dudgeon, R. E.* *Ph. Mg.* 41 (1871) 350-.
- , in dark, and at a distance. *Anon.* (v. 346) *Edinb. N. Ph. J.* 6 (1829) 61-.

- Visual angle in decreasing light. *Albertotti, G.* *Mod. Ac. Sc. Mm.* 10 (1894) 353-.
- perceptions, number of possible. *Doppler, C.* *Böhm. Gs. Ab.* 5 (1847) 391-.
- Volkmann's line of sight, and cause of indistinctness outside axis of eye. *Stamm, W.* *Pogg. A.* 57 (1842) 346-.

## 4410 Construction and Dioptrics of the Eye.

(See also *Physiology, 3711.*)

### CONSTRUCTION.

- Schoeler, —.* *Arch. f. Oph.* 30 (1884) (Ab. 3) 301-.
- Blind spot, visibility. *Charpentier, A.* *C. R.* 126 (1898) 1634-.
- Cornea, radius of curvature. *Chapman, H. C., & Brubaker, A. P.* *Philad. Ac. Nt. Sc. P.* (1893) 349-.
- , shape, and influence on vision. *Sulzer, —.* *Arch. Sc. Ps. Nt.* 26 (1891) 483-.
- Direct distance of negative physiological scotoma from fixed point and from Mariotte's spot. *Basevi, V.* [1890] *Arch. Augenh.* 22 (1891) 1-.
- Directions of sight and of rays. *Bartels, C. M. N.* *Oken Isis* (1834) 698-.
- Fundus, anterior limit of portion visible with ophthalmoscope. *Groenouw, A.* *Arch. f. Oph.* 35 (1889) (Ab. 3) 29-.
- Illumination of inner eye by heterocentric glass mirrors. *Zehender, W.* *Arch. f. Oph.* 2 (1856) (2 Ab.) 103-.
- Images of human eye, the seven. *Tscherning, —.* *Par. S. Ps. Sé.* (1892) 288-.
- Indirect vision, parallax, and pupil of cats. *Kirschmann, A.* *Ph. Stud.* 9 (1894) 447-.
- Insects' eyes. *Grüel, C. A.* *Pogg. A.* 119 (1863) 640-.

- Insects' eyes, cornea. *Gorham, J. J. Mrc. Sc.* 1 (1853) 76-.
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- Line of sight, position, and centration of refractive surfaces. *Ehrnrooth, M.* *Pflüg. Arch. Pl.* 35 (1885) 390-.
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- Ophthalmoscopic image, seat and character. *Bassi, G.* *Rv. Sc. [Ind.]* 30 (1898) 143-.
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- , periscopic, geometric form of theoretical retina. *Matthiessen, H. F. L.* *Arch. f. Oph.* 25 (1879) (Ab. 4) 257-.
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- Delahousse, G.* *Arch. Gén. Md.* 27 (1876) 674-.
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- Mislavskij, N. A.* *Kazan S. Nt. (Ps.-Mth.) P.* 8 (1890) 282-.
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- — —, law of increase in mammals and fishes. *Matthiessen, L.* Arch. f. Oph. 31 (1885) (Ab. 2) 31-.
- — —, power. *Matthiessen, L.* Meckl. Vr. Nt. Arch. (1886) xii-.
- — —, — in vertebrates. *Moennich, P.* Pflüg. Arch. Pl. 40 (1887) 397-.
- — —, stratified, differential equations. *Matthiessen, H. F. L.* Pflüg. Arch. Pl. 19 (1879) 490-; Z. Mth. Ps. 24 (1879) 804-; 26 (1881) 179-; 28 (1883) 211-.
- — —, structure and optical phenomena. *Matthiessen, L.* Meckl. Vr. Nt. Arch. (1888) iv-.
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- Dispersion of human eye, exact determination. *Matthiessen, Ad.* Bb. Un. Arch. 5 (1847) 221-.
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- — — optical instrument. *Cherrill, A. K.* Eastbourne NH. S. Pp. (1874-75) (May) 2 pp.
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- — —, best form of schemata. *Groenouw, A.* Arch. Augenh. 31 (1895) (Festschr.) 73-.
- — —, experimental determination. *Leboucher, —.* Caen Mm. S. L. 13 (1864) No. 4, 26 pp.
- — — and spectacles, definition of meridian in estimating. *Knapp, H.* Arch. Augenh. 16 (1886) 195-; Arch. Oph. 15 (1886) 207-.
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- Liquids of eye, refractive indices. *Cyon, E.* Arch. de Pl. 2 (1869) 555-.
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- — — — —. *Raymond, G. M.* Chambéry Mm. Ac. Sav. 3 (1828) 109-.
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- Respighi, L.* [1856] Bologna Mm. Ac. Sc. 8 (1857) 355-.
- Laugier, P. A. E.* C. R. 44 (1857) 841-.
- Jones, T. W.* R. S. P. 10 (1859-60) 390-.
- Tscherning, M.* [1900] Sc. Abs. 4 (1901) 581.
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 (Pictet.) *Le Conte, J.* Arch. Sc. Ps. Nt. 41 (1871) 394-.  
 (Le Conte.) *Pictet, R.* Arch. Sc. Ps. Nt. 43 (1872) 61-.  
*Sulzer, —.* [1895] Arch. Sc. Ps. Nt. 1 (1896) 81-.  
 abnormal effects. *Davis, W. S. B. A.* Rp. 43 (1878) (Sect.) 36-.  
 and binaural hearing. *Dove, H. W.* Berl. B. (1841) 251-.  
 Hering's fall experiment. *Greeff, R. Z.* Psychol. 8 (1892) 21-.  
 illusions. *Soret, J. L.* Bb. Un. Arch. 30 (1855) 136-.  
 —. *Le Conte, J.* Am. J. Sc. 34 (1887) 97-.  
 —. *Dissard, A.* Bv. Sc. 12 (1899) 257-, 296-.  
 measurement of advantages over monocular. *Valérius, H.* Brux. Ac. Bll. 34 (1872) 84-.  
 and micrography. *Castracane degli Antelminelli, (conte abate) F.* Rm. N. Linc. At. 27 (1874) 265-.  
 versus monocular. *Hyslop, J. H.* Science 11 (1888) 71-.  
 —. *Le Conte, J.* Science 11 (1888) 119.  
 —, brightness. *Thompson, S. P. B. A.* Rp. (1877) (Sect.) 32.  
 normal motions of eye in. *Helmholtz, H. R.* S. P. 13 (1864) 186-.  
 in optical instruments. *Giraud-Teulon, —.* C. R. 52 (1861) 22-.  
 of prismatic colours. *Dove, H. W.* Berl. B. (1850) 152-.  
 — — —, and new stereoscopic method. *Dove, H. W.* Pogg. A. 80 (1850) 446-.  
 and retinal images. *Judd, C. H.* Science 7 (1898) 425-.  
 — spectacles. *Giraud-Teulon, —.* C. R. 50 (1860) 382-.  
 — stereoscope. *Wheatstone, (Sir) C. B. A.* Rp. (1838) (pt. 2) 16-.  
 —. *Tyndall, J.* [1856] Pht. S. J. 3 (1857) 96-, 116-, 167-.  
 —. *Newton, J.* Lanc. T. Hist. S. 9 (1857) 272-.  
 —. *Claparède, É.* Bb. Un. Arch. 3 (1858) 138-.  
 —. *Donkin, W. F.* Phot. J. 12 (1868) 45-.  
 —. *Blath, L.* Magdeb. Nt. Vr. Jbr. u. Ab. (1894-96) 69-.  
 tests. *Lippincott, J. A.* Am. Oph. S. T. (1890) 560-.  
 theory. *Prevost, A. P.* Bb. Un. 48 (1843) 155-.  
 —. *W., C. J. (jun.)* Franklin I. J. 40 (1860) 325-.  
 —. *Bezold, W. von.* Münch. Ak. Sb. (1864) (2) 372-; Z. Bl. 1 (1865) 237-; 2 (1866) 178-.

Chimenti pictures. *Joy, C. A.* Am. J. Sc. 38 (1864) 199-.  
 Converging sun-beams. *Powell, B. B. A.* Rp. (1852) (pt. 2) 12.

## 4440 Distance

## Binocular Vision

## Magnitude 4440

## DISTANCE.

- Wedgwood, T. QJ. Sc. 3 (1817) 1-.
- Messer, H. A. Ps. C. 157 (1876) 172-.
- Hirth, G. Czgt. Opt. 14 (1893) 219-.
- Rouse, J. E. Kan. Un. Q. 5 (1896) 109-.
- and angles, and illusions. *Delbœuf, J.* Brux. Ac. Bil. 19 (1865) 195-.
- apparent, of the heavens. *Fontana, G.* Turin Mm. Ac. (1802-03) 289-.
- and binocular vision. *Brewster, (Sir) D.* Edinb. R. S. T. 15 (1844) 663-; Ph. Mg. 30 (1847) 305-.
- — — *Helmholtz, H. L. F. von.* Arch. An. Pl. (Pl. Ab.) (1878) 322-.
- dependence of relative estimations on concept of absolute distance. *Heine, L.* Arch. f. Oph. 51 (1900) 563-.
- estimation. *Donders, F. C.* [1871] (xii) Amst. Ak. Wet. P. (1871-72) (No. 1) 4.
- idea produced by stereoscope. *Beck, J. B. A.* Rp. (1859) (pt. 2) 61.
- illusions. *Kundt, A.* Pogg. A. 120 (1863) 118-.
- of objects seen by reflection and refraction, influence of binocular vision. *Dove, H. W.* Berl. Mb. (1858) 312-.
- phantom images. *Le Conte, J.* Science 21 (1893) 333-.
- — — *Bostwick, A. E.* Science 21 (1893) 345-.
- Fechner's paradoxon. *Robinson, T. R.* Am. J. Psychol. 7 (1895) 9-.
- — (Robinson). *Kirschmann, A.* Am. J. Psychol. 7 (1895) 23-.
- Field of view with flat and solid objects, limits of correspondences. *Schöbler, H.* Arch. f. Oph. 19 (1873) 1-.
- — — influence of one eye on other. *Gazzaniga, C. L.* A. Sc. Lomb. Ven. 4 (1834) 265-, 302-.
- Horopter. [*Claparède, non*] *Clapeyron, E.* C. R. 47 (1858) 566.
- *Claparède, É.* Bb. Un. Arch. 3 (1858) 138-, 225-; Reichert Arch. (1859) 384-.
- *Helmholtz, H.* A. Ps. C. 123 (1864) 158-; Arch. f. Oph. 10 (1864) (Ab. 1) 1-.
- *Cellérier, C.* St. Pét. Ac. Sc. Mm. 17 (1872) (No. 11) 57-.
- *Schur, F.* Dorpat Sb. 9 (1892) 162-.
- , determination. *Helmholtz, H.* [1862] (vi Adds.) Heidl. Vh. Nt. Md. 3 (1862-63) 51-, 122-.
- — *Hankel, H.* A. Ps. C. 122 (1864) 575-.
- — *Franklin, (Mrs.) C. L.* [1887] Am. J. Psychol. 1 (1888) 99-.
- Iconoscope. *Javal, E.* C. R. 63 (1866) 927-.
- Iridescence of certain beetles. *Oppel, J. J.* Frkf. Jbr. Ps. Vr. (1858-59) 64-.
- IsoSCOPE. *Donders, F. C.* (xii) Amst. Ak. Wet. P. (1874-75) (No. 10) 2-.
- Limits of recognition of position differences. *Best, —.* Arch. f. Oph. 51 (1900) 453-.
- Listing's law, consequences. *Tscherning, —.* A. d'Ocul. 100 (1868) 101-.

- Luminous beams. *Powell, B. B. A.* Rp. (1852) (pt. 2) 11-.
- Lustre. *Haidinger, W.* Wien SB. (1848) 439-.
- , apparatus for producing. *Rood, O. N.* Am. J. Sc. 39 (1865) 260.
- , cause. *Wundt, W.* Pogg. A. 116 (1862) 627-.
- , Dove's theory, experiments. *Rood, O. N.* Silliman J. 31 (1861) 339-.
- and irradiation, causes shown by chromatic experiments with stereoscope. *Dove, H. W.* Berl. B. (1851) 246-.
- , stereoscopic explanation. *Oppel, J. J.* (vi Adds.) Frkf. Jbr. Ps. Vr. (1853-54) 52-; (1854-55) 33-; (1856-57) 56-.
- — — *Helmholtz, H.* Rheinl. Westphal. Sb. 13 (1856) xxxviii-.
- — — *Oppel, J. J.* Pogg. A. 100 (1857) 462-.

## MAGNITUDE.

- apparent. [*Lubimoff non*] *Lurimoff, N.* C. R. 47 (1858) 24-.
- *Lubimoff, N.* A. C. 54 (1858) 13-.
- , changes. *Lehot, C. J.* Férussac Bll. Sc. Mth. 7 (1827) 245-.
- , — due to movement of eyes. *Henry, C.* C. R. 119 (1894) 449-, 872.
- , of magnified objects. *Brewer, W. H.* [1862] Am. As. P. 31 (1863) 159-.
- , in relation to retinal image. *Martius, G.* Ph. Stud. 5 (1889) 601-.
- cause of different apparent magnitudes of same objects. *Walker, Ez.* Tilloch Ph. Mg. 30 (1808) 163-.
- determination. *Rozenberg, V. L.* Rs. Ps.-C. S. J. 29 (Ps.) (1897) 124-; Ftschr. Ps. (1897) (Ab. 2) 138.
- estimation of linear and angular. *Bartoli, A.* N. Cim. 16 (1876) 74-, 234-.
- in visual field. *Fischer, R.* Arch. f. Oph. 37 (1891) (Ab. 1) 97-, (Ab. 3) 55-.
- figures of unequal magnitude, coalescence in stereoscope. *Worden, J.* Pht. S. J. 3 (1857) 226-.
- illusions. *Delbœuf, J.* Brux. Ac. Bil. 20 (1865) 70-.
- subjective, of monocular and binocular images in lens. *Delage, Y.* Arch. Z. Exp. 1 (1893) vi-.
- Monocular vision, phenomenon with microscope. *Furlonge, W. H.* [1872] Quek. Mcr. Cl. J. 3 (1873) 39-.
- Optics and painting. *Helmholtz, H. L. F. von.* Rv. Sc. 11 (1876) 241-.
- Perception of depth. *Schubring, G.* Halle Z. Nw. 30 (1867) 253-.
- — — in painting. *Nicolaï, C.* [1896] Ndl. Gast. Oogl. Vs. 33 (1897) (Ndl. Ooghk. Bijdr. Aft. 2) 17-.
- Perspective. *Chevreul, M. E.* [1859] Par. Ac. Sc. Mm. 30 (\*1860) 383-.
- *Stevens, W. Le C.* Ph. Mg. 13 (1862) 309-.
- , apparent inversion with telescope. *Forbes, J. D.* Ph. Mg. 16 (1840) 506-.
- appearance of aerial light and shade. *Faraday, M.* QJ. Sc. 22 (1827) 81-.

- Perspective, binocular. *Stevens, W. Le C.* Nt. 26 (1882) 68-.
- , —, and movements of eye. *Böttcher, (Dr.)* Arch. f. Oph. 12 (1866) (Ab. 2) 23-.
- , —, Wheatstone's and Brewster's theory. *Stevens, W. Le C.* [1881] N. Y. Ac. T. 1 (1881-82) 9-.
- illusion. *Bezold, W. von.* A. Ps. C. 28 (1884) 351-.
- —. *Lataste, F.* Chili S. So. Act. 3 (1893) 3-.
- — from use of myopic glasses. *MacDougall, R.* Science 9 (1899) 901-.
- , taught by luminous projection. *Gobin, A.* Lyon S. Ag. A. 5 (1882) 115-.
- Phantoscope. *Locke, J.* Silliman J. 9 (1850) 153-.
- , passage in Lucretius. *Plateau, J. A. F.* Bb. Un. Arch. 20 (1852) 300-.
- Pseudoscopic deviation of parallel lines. *Zöllner, F.* Pogg. A. 114 (1861) 587-.
- — — (Zöllner). *Jastrow, J.* Am. J. Psychol. 4 (1892) 381-, 427.
- — — —. *Guye, A. A.* Rv. Sc. 51 (1893) 593-.
- observations. *Mohr, C. F.* Pogg. A. 111 (1860) 638-.
- phenomena. *Rollmann, W.* A. Ps. C. 134 (1868) 615-.
- of motion. *Sinsteden, —.* Pogg. A. 111 (1860) 336-.
- and statics of retina. *Scheffler, H.* A. Ps. C. 127 (1866) 105-.
- vision. *Schröder, H.* Pogg. A. 87 (1852) 306-; 105 (1858) 298-.
- , illusion. *Willigen, V. S. M. van der.* Amst. Vs. Ak. 2 (1854) 153-.
- through prisms. *Dancer, J. B.* Manch. Lt. Ph. S. P. 4 (1865) 157-.
- Pseudoscopy. *Zöllner, F.* Pogg. A. 110 (1860) 500-.
- (Zöllner). *Bacaloglo, E.* Pogg. A. 113 (1861) 333-.
- , monocular and binocular. *Dove, H. W.* Berl. Mb. (1857) 221-.
- Relief, apparent, of hollow casts, apparatus to produce. *Moussard, E.* C. B. 124 (1897) 182-.
- , mechanism of production. *Giraud-Teulon, —.* C. R. 45 (1857) 566-.
- — — (Giraud-Teulon). *Studiati, C.* N. Cim. 8 (1858) 265-.
- phenomena. *Burckhardt, F.* A. Ps. C. 137 (1869) 471-.
- , stereoscopic perception, and by direct vision. *Douliot, E.* N. Cim. 10 (1859) 342-.
- Retinal impression, inability to determine which retina is impressed. *Rogers, W. B.* Am. As. P. (1860) 192-.
- Simultaneous contrasts of brightness, metric experiments on regularity. *Hess, C., & Pretori, H.* Arch. f. Oph. 40 (1894) (Ab. 4) 1-.
- Space perception. *Jaesche, E.* Dorpat Sb. 9 (1892) 166-.
- —. *Wundt, W.* Ph. Stud. 14 (1898) 1-.
- —, monocular indirect vision. *Müller, R.* Ph. Stud. 14 (1898) 402-.
- —, region, demonstration of contrast phenomena. *Loeb, J.* Pflüg. Arch. Pl. 60 (1895) 509-.
- Steneographic projection. *Simon, P. L.* Gilbert A. 32 (1809) 57-.
- Stereograms of surfaces, construction. *Maxwell, J. C.* [1868] L. Mth. S. P. 2 (1869) 57-.
- Stereograph, pocket. *Plucker, J.* Brux. Ac. Bll. 30 (1870) 388-.
- Stereographs produced by hand. *Rood, O. N.* Silliman J. 31 (1861) 71-.
- Stereoscopic detection of forgeries, etc. *Dove, H. W.* Berl. Mb. (1859) 280-.
- images, anomalies. *Claudet, A.* [1856] R. S. P. 8 (1856-57) 104-.
- methods, 2 new. *Rollmann, W.* Pogg. A. 90 (1853) 186-.
- photography, compound. *Ellie, R.* As. Fr. C. R. (1896) (Pt. 1) 146.
- — giving exact perspective. *Cazes, —.* Par. S. Ps. Sé. (1885) 115-.
- pictures. *Steinhauser, A.* Carl Rpm. 12 (1876) 389-.
- —, angle. *Claudet, A.* B. A. Rp. (1853) (pt. 2) 4.
- —, geometrical construction. *Steinhauser, A.* Halle Z. Nw. 36 (1870) 66-.
- —, new form (anaglyphs). *Giltay, J. W.* [1895] Mbl. Nt. (1895-96) 1-, 13-.
- —, — —. *Watch, A. F.* Franklin I. J. 140 (1895) 401-.
- — with ordinary camera. *Barnard, F. A. P.* Silliman J. 16 (1853) 348-.
- —, preparation. *Hessemer, J. M.* Dingler 139 (1856) 111-.
- — with single camera. *Clark, L.* [1853] Pht. S. J. 1 (1854) 57-.
- representation of bodies. *Dove, H. W.* Berl. Mb. (1857) 291.
- — — continuous gaseous spectra. *Poleck, T.* Bresl. Jbr. Schl. Gs. 49 (1871) 34-.
- — — type as seen with both eyes through calc-spar. *Dove, H. W.* Berl. Mb. (1859) 278-.
- shadow figures. *Szili, A.* [1894] Termt. Közl. 27 (1895) 158; Mth. Nt. B. Ung. 12 (1895) 426-.
- slide, new. *Rogers, W. B.* Am. Ac. P. 4 (1857-60) 360-.

## STEREOSCOPIC VISION.

- Towne, J.* Guy's Hosp. Rp. 8 (1862) 70-, 81-.
- Listing, J. B.* Gött. Nr. (1869) 481-.
- Kohlrausch, F.* Gött. Nr. (1870) 415-; A. Ps. C. 143 (1871) 144-.
- Righi, A.* N. Cim. 14 (1875) 55-.
- Helmholtz, H. L. F. von.* L. Ps. S. P. 4 (1881) 260-; Ph. Mg. 11 (1881) 507-.
- Himes, C. F.* N. Y. Ac. T. 1 (1881-82) 114-.
- Hoppe, J.* Pflüg. Arch. Pl. 40 (1887) 523-.
- Stevens, W. Le C.* Science 9 (1887) 14.
- Anderson, W. W.* Science 9 (1887) 56.
- Jastrow, J.* Science 7 (1898) 615-.
- Grützner, —.* [1899] Würtb. Jh. 56 (1900) lv-.
- accommodation in. *Oppel, J. J.* (xii) Frkf. a. M. Ps. Vr. Jbr. (1860-61) 48-.
- apparent relief in. *Oppel, J. J.* Frkf. Jbr. Ps. Vr. (1858-59) 64-.
- best aperture. *Carpenter, W. B.* (ix) Mor. S. T. 15 (1867) 105-.

## 4440 Stereoscopic Vision

experiments. *Rood, O. N.* Silliman J. 34 (1862) 199-.

with one eye. *Mach, E.* Wien Sb. 58 (1868) (Ab. 2) 731-.

— — —. *Pratt, W. H.* Science 8 (1886) 631-.

illusion. *Monro, C. J.* [1864] Ph. Mg. 29 (1865) 15-.

by optic divergence. *Stevens, W. Le C.* Am. J. Sc. 22 (1881) 358-, 443-.

phenomena. *Dove, H. W.* B. A. Rp. (1854) (pt. 2) 9-.

— *Cima, A.* N. Cim. 6 (1857) 185-; C. R. 45 (1857) 664.

— *August, F.* Pogg. A. 110 (1860) 582-.

— *Meyer, O. E.* Bresl. Schl. Gs. Jbr. (1895) (Ab. 2a) 4.

without stereoscope. *Dufour, L.* Laus. Bll. S. Vd. 5 (1857) 263-.

— *Lamy, C. A.* [1861] (xii) Lille S. Mm. 8 (1862) 447-.

strain on eyes in. *Oppel, J. J.* Frkf. Jbr. Pa. Vr. (1858-59) 64-.

Stereoscopy. *Rollmann, W.* Pogg. A. 89 (1853) 350-.

— *Dove, H. W.* Pogg. A. 110 (1860) 494-.

— *Donders, F. C.* (xii) Amst. Ak. Wet. P. (1872-73) (No. 7) 8-.

— *Hugel, T.* Carl Rpm. 13 (1877) 268-.

— with exact relief. *Cazes, L.* Par. S. Pa. Sé. (1895) 124-.

— and photography, applications. *Mach, E.* Wien Sb. 54 (1866) (Ab. 2) 123-.

—, radiographic. *Chabaud, V.* Par. S. Pa. Sé. (1898) 154-.

—, —. *Lambertz, —.* [1900] Fschr. Röntgenstr. 4 (1900-01) 1-.

Stereotrope. *Shaw, W. T.* [1861] R. S. P. 11 (1860-62) 70-.

Telestereoscopic vision, limits. *Wächter, F.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 856-.

Vision, disparate. *Stevens, W. Le C.* Science 11 (1888) 241.

— of landscapes with normal and abnormal adjustment of eyes. *Müller, Alex.* Pogg. A. 86 (1852) 147-.

— objects with converging lines, inversion. *Hoppe, —.* Pfüg. Arch. Pl. 43 (1888) 295-.

—, single and double. *Lathrop, S. P.* Silliman J. 7 (1849) 343-.

—, — —, and illusion as to distance. *Locke, J.* Silliman J. 7 (1849) 68-.

—, — —, stereoscopic study. *Wyld, R. S.* Edinb. R. S. P. 8 (1875) 505-.

—, solid, with or without stereoscope. *Müller, H.* Cztg. Opt. 19 (1898) 201-.

Visual appearance of high monuments. *Rémy, A.* Rv. Sc. 43 (1889) 668-.

— — —. *Bourdon, B.* Rv. Sc. 43 (1889) 763-.

— — —. *Rozier, F.* Rv. Sc. 44 (1889) 26-.

— — —. *Rémy, A.* Rv. Sc. 44 (1889) 237-.

## Colour Vision 4450

Visual appearance of high monuments. *Rozier, F.* Rv. Sc. 44 (1889) 653-.

— — — — objects. *Sorel, G.* Rv. Sc. 45 (1890) 564-.

— axes, inclination. *Prevost, P. A. C.* 14 (1820) 397-.

## 4450 Colour Vision. Subjective Colours. Colour Blindness. (See also Physiology, 3735.)

### COLOUR VISION.

*Prieur, C. A.* A. C. 54 (1805) 5-.

*Maxwell, J. C.* Ph. Mg. 14 (1857) 40-.

*Gladstone, J. H.* B. A. Rp. (1860) (pt. 2) 12-.

*Aitken, J.* (ix) Sc. S. Arts T. 8 (1872) 375-.

*Peirce, C. S.* Am. J. Sc. 13 (1877) 247-.

*Weinhold, A. F.* A. Ps. C. 2 (1877) 631-.

*Hoh, T.* (xii) Bamb. Nf. Gs. B. (12) (1882) (No. 6) 4 pp.

*Swan, J. W.* Nt. 26 (1882) 246.

*Droop, H. R.* L. Ps. S. P. 5 (1884) 217-; Ph. Mg. 15 (1883) 373-.

*St. Clair, G.* [1884] Birm. Ph. S. P. 4 (1883-85) 117-.

*Vogel, H. W.* A. Ps. C. 28 (1886) 130-.

*Cooke, F. G.* [1887] Eastbourne NH. S. T. 2 (1886-94) 35-.

*Isaachsen, D.* Pfüg. Arch. Pl. 43 (1888) 289-.

*Vogel, H. W.* Berl. Ps. Gs. Vh. (1888) 56-; Humb. 7 (1888) 315-; Lpldina. 24 (1888) 106-, 128-.

*Whitmell, C. T.* Card. Nt. S. T. 19 (1888) 67-.

*Vogel, H. W.* Berl. Ps. Gs. Vh. (1890) 1-.

*Roy. Soc. Comm.* R. S. P. 51 (1892) 290-.

*Guéhard, A.* As. Fr. C. R. (1894) (Pt. 1) 121.

*Nicati, W.* C. R. 119 (1894) 917-, 974.

*Vogel, H. W.* Berl. Ps. Gs. Vh. (1894) 97-; D. Nf. Vh. (1897) (Th. 2, Hälfte 1) 44-.

*Stevens, W. Le C.* Science 7 (1898) 513-, 677-.

*Titchener, E. B.* Science 7 (1898) 608-, 832-.

*Franklin, (Mrs.) C. L.* Science 7 (1898) 773-; 8 (1898) 329-.

*Whitman, F. P.* Am. As. P. (1898) 83-.

Apparatus. *Glan, P.* [1880] Pfüg. Arch. Pl. 24 (1881) 307-.

Apparent motion of figures of certain colours. *Loomis, E.* Am. As. P. (1850) 293-; (1851) 78-.

Bichromatic vision. *Stephenson, J. W. M.* Mcr. J. 7 (1872) 215-.

Brightness of pigments by oblique vision. *Whitman, F. P.* Science 9 (1899) 784-.

Chromatropie, new. *Morton, H. A.* Ps. C. 157 (1876) 150-.

Chromostroboscopic experiments. *Riccd, A.* Mod. S. Nt. An. 10 (1876) 31-.

Colorimeter. *Houton de la Billardière, J. J.* Rouen Tr. Ac. (1827) 73-.

— *Beek, A. van.* Amst. N. Vh. 2 (1829) 217-; Schweigger J. 62 (=Jb. 2) (1831) 246-.

— *Müller, Alex.* Erdm. J. Pr. C. 60 (1858) 474-.

- Colorimeter. *Norway, L.* [1892] *Termt. Közl.* 25 (1893) 158-; *Mth. Nt. B. Ung.* 11 (1894) 426.
- , complementary. *Müller, Alex.* *Erdm. J. Pr. C.* 66 (1855) 193-; *Fresenius Z.* 2 (1863) 143-.
- , detached, and colorimetry. *Mills, E. J.* *Ph. Mg.* 7 (1879) 437-.
- , portable. *Mills, E. J.* *Glasg. Ph. S. P.* 10 (1877) 310-.
- Colour box, experiments with Lord Rayleigh's. *Schuster, A.* [1890] *R. S. P.* 48 (1891) 140-.
- change apparatus. *Hessel, J. F. C.* *Pogg. A.* 79 (1850) 442-.
- combinations by polarised light. *Spottiswoode, W.* [1874] *R. S. P.* 22 (1874) 354-; *R. I. P.* 7 (1875) 291-.
- constants. *Rood, O. N.* *J. Sc.* 6 (1876) 458-.
- — and intensity of clouded light for chromometry. *Müller, Alex.* *D. C. Gs. B.* 4 (1871) 105-.
- discrimination, formation of shadow and perspective in. *Einhoven, W.* *Brain* 16 (1893) 191-; *Ndl. Gast. Oogl. Vs.* 35 (1894) 14 pp.
- and distance, relation between perception. *Rood, O. N.* *Silliman J.* 32 (1861) 184-.
- map, construction. *Bailey, W.* [1892] *L. Ps. S. P.* 11 (1892) 323-; 12 (1894) 1-; *Ph. Mg.* 33 (1892) 496-; 35 (1893) 46-.
- law, Newton's. *Hering, E.* *Lotos* 35 (1887) 177-.
- , —. *König, A.* *Berl. Ak. Sb.* (1887) 311-.
- , —. *Tonn, E.* *Z. Psychol.* 7 (1894) 279-.
- , —, in green blindness. *Brodhun, E.* *Z. Psychol.* 5 (1893) 323-.
- method. *Bezold, W. von.* *Münch. Ak. Sb.* 6 (1876) 106-.
- , *Hilbert, R.* *Humb.* 3 (1884) 257-.
- monocular. *Szilágyi, E.* (xii) *Cb. Md. Wa.* 19 (1881) 513-.
- optical and mechanical, differences. *Petrusevskij, T. T.* *Rs. Ps.-C. S. J.* 25 (Ps.) (1893) 264.
- theory. *Grassmann, H.* *Pogg. A.* 89 (1853) 69-.
- , *Graulich, W. J.* *Wien SB.* 12 (1854) 783-; 13 (1854) 201-.
- , and colour vision. *Bohn, C.* *A. Ps. C.* 125 (1865) 87-.
- Colour patterns in natural productions. *Higgins, H. H.* *Lpool. Lt. Ph. S. P.* 11 (1856-57) 133-.
- photometry in spectrum. *Abney, (Capt.) W. de W., & Festing, (Maj.-Gen.) E. R.* [1886] *Phil. Trans.* 177 (1887) 423-.
- of red or yellow objects viewed through red or yellow glass. *Le Gentil, —.* *A. C.* 10 (1791) 225-.
- scale. *Biot, J. B.* *Par. S. Phlm. Bil.* (1816) 144-; (1818) 90-.
- , Newtonian. *Govt, G. C. R.* 105 (1887) 733-.
- scheme, standard. *Pillsbury, J. H.* [1892-95] *Science* 19 (1892) 114; 21 (1893) 310-; *Nt.* 52 (1895) 390-; 53 (1895-96) 55.
- sensations, mathematical representation. *Feret, R.* *C. R.* 102 (1886) 44-, 256-, 608-.
- , persistence. *Stein, W. J.* *Pr. C.* 113 (1872) 328-.
- sense, determination by spectroscope. *Donders, F. C.* (xii) *Amst. Ak. Wet. P.* (1880-81) (No. 8) 2-.
- , intensity distribution in spectrum. *König, A., & Dieterici, C.* *Berl. Ak. Sb.* (1886) 305-; *Z. Psychol.* 4 (1893) 241-.
- systems. *Donders, F. C.* [1880-84] *Utr. Oz.* 6 (1881) 79-; 8 (1883) 1-; *Arch. f. Oph.* 30 (1884) (Ab. 1) 15-.
- , *Rood, O. N.* [1891] *Am. J. Sc.* 44 (1892) 263-.
- , *Kries, J. von.* *Z. Psychol.* 13 (1897) 241-, 473.
- , dichromatic. *Donders, F. C.* [1878] (xii) *Amst. Ak. Wet. P.* (1878-79) No. 6, 3-.
- , —. *König, A.* *A. Ps. C.* 22 (1884) 567-.
- , shortest lines in. *Helmholtz, H. von.* *Berl. Ak. Sb.* (1891) 1071-.
- , trichromatic. *Kries, J. von.* *Z. Psychol.* 19 (1899) 63-.
- top, cinephantic. *Hunt, E.* [1859] *Glasg. Ph. S. P.* 4 (1860) 252-.
- triangles by mixtures of real colours. *Bezold, W. von.* [1885] *Münch. Ak. Sb.* 15 (1886) 305-.
- Coloured glasses, binocular vision through. *Dove, H. W.* *Pogg. A.* 101 (1857) 147-; *Berl. Mb.* (1861) 1054-.

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- Challis, J.* *Ph. Mg.* 12 (1856) 521-.
- Baumeister, (Prof.)* —. *Carlsruhe Vh. Nw. Vr.* 2 (1866) 8-.
- Moutier, J.* [1882-83] *Par. S. Phlm. Bil.* 7 (1883) 19-; *Lum. Élect.* 8 (\*1883) 22-.
- Schelske, L. E. R.* *A. Ps. C.* 16 (1882) 349-.
- (Lecture experiment.) *Vogel, H. W.* *Berl. Ps. Gs. Vh.* (1887) 28-.
- apparatus. *Ketteler, E.* *A. Ps. C.* 141 (1870) 604-.
- , *Szilágyi, E.* (xii) *Orv.-Term. Éts.* 6 (1881) (*Orv. Szak*) 60-.
- , *Hoffert, H. H.* *L. Ps. S. P.* 6 (1885) 200-; *Ph. Mg.* 18 (1884) 81-.
- , *Aitken, J.* *Edinb. R. S. P.* 13 (1886) 122-.
- , new Helmholtz. *Schmidt, F., & Haensch,* —. *Z. Instk.* 13 (1893) 200-.
- binocular. *Bezold, W. von.* (vii) *Pogg. A. (Jubelbd.)* (1874) 585-.
- calculation. *Lommel, E.* *Münch. Ak. Ab.* 17 (1892) 491-.
- by dissolved dyes. *Klobukow, N. von.* *A. Ps. C.* 43 (1891) 438-.
- homogeneous colours. *Helmholtz, H. B. A. Rp.* (1853) (pt. 2) 5; *Fechner Cb.* 1 (1853) 3-.
- , —. *Preyer, W. T.* *Bonn. Cor.-Bl. NH.* Vr. (1868) 57-.
- interference and absorption colours. *Dove, H. W.* *Berl. Mb.* (1857) 217-.
- law. *König, W.* *Frkf. a. M. Ps. Vr. Jbr.* (1897-98) 35-.
- , Newton's. *Bezold, W. von.* *Berl. Ps. Gs. Vh.* (1887) 55 (*bis*)-.

- Coloured glasses, optical observation with. *Marz, C. M. D. Nf. Vsm. B.* (1843) 235.  
 — light, action on retina, experiments. *Pergens, É. I. Solvay Tr. 1 (Fasc. 2)* (1897) 38 pp.  
 — surfaces, efficiency of eye in distinguishing two. *Broca, A. Par. S. Ps. Sé.* (1894) 119-  
 —, reflex action in artists' studios. *Wiener, L. C.* [1880] (xii) Karlsruhe Nt. Vr. Vh. 8 (1881) 265-; 9 (1883) 10-.

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- analogy and harmony. *Hargreaves, T. Tilloch Ph. Mg.* 50 (1817) 128-  
 — — (Hargreaves). *Tilloch, A. Tilloch Ph. Mg.* 50 (1817) 241-  
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 —. *Doppler, C. Böhm. Gs. Ab.* 5 (1847) 401-  
 —. *Forbes, J. D. Ph. Mg.* 34 (1849) 161-; *Edinb. R. S. P.* 2 (1851) 214-  
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- Complementary Colours.
- Breda, J. G. S. van. Gilbert A.* 54 (1816) 321-  
*Osann, G. Pogg. A.* 37 (1836) 287-; 42 (1837) 72-  
*Maumené, E. J. (viii) Reims Sé. Ac.* 11 (1850) 274-  
*Meyer, M. H. Pogg. A.* 95 (1855) 170-  
*Lessen, E. Lieb. A.* 104 (1857) 177-  
*Osann, G. Würzb. Nw. Z.* 1 (1860) 61-  
*(Osann.) Fechner, G. T. Leip. B.* 12 (1860) 146-  
*Brücke, E. Wien Sb.* 51 (1865) (Ab. 2) 461-  
*Murphy, J. J. Nt.* 16 (1877) 208-  
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 —. *Petrusevskij, T. T. Rs. Ps.-C. S. J.* 29 (Ps.) (1897) 1-  
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 —. *De la Rive, L. Arch. Sc. Ps. Nt.* 19 (1888) 391-  
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 —, — (Challis). *Stokes, G. G. Ph. Mg.* 12 (1856) 421-  
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 —, — (Helmholtz). *Plateau, J. A. F. Pogg. A.* 88 (1853) 172-  
 —, —, with reference to mixtures of blue and yellow light. *Maxwell, J. C. B. A. Rp.* (1856) (pt. 2) 12-  
 —, —, and relations of colours of spectrum. *Maxwell, J. C. Phil. Trans.* (1860) 57-; *R. S. P.* 10 (1859-60) 484-  
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 —, smallest perceptible, alteration of wave-length of light necessary to produce. *Uthoff, W.* [1888] *Arch. An. Pl. (Pl. Ab.)* (1889) 171-  
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 —, — (Unger). *Plateau, J. A. F. Pogg. A.* 88 (1853) 172-  
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 —, — —. *J., J. R. L. Pol. Mg.* 2 (1845) 171-  
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 — — — — — sodium yellow. *Donders, F. C. Amst. Ak. Wet. P.* (1883-84) No. 9, 9-  
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 mutual behaviour. *Seebeck, T. J. Schweigger J. 1* (1811) 4-.  
 natural, production, and law of colour mixture. *König, W. Frkf. a. M. Ps. Vr. Jbr.* (1897-98) 36-.  
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 —, new apparatus for studying. *Nardroff, E. R. von. Science* 2 (1895) 352.  
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*Brewster, (Sir) D. B. A. Rp.* (1855) (*pt. 2*) 7-; *Rosenstiehl, A. C. R.* 92 (1881) 1286-; *Par. S. Ps. Sé.* (1881) 166-.  
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*Wilser, —. Karlsruhe Nt. Vr. Vh.* 10 (1888) (*Sb.*) 176-.  
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 ————. *Bouty, E. C. N.* 30 (1874) 152-.  
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 — and nature. *Anon.* (vi 535) *Gergonne A. Mth.* 10 (1819-20) 228-.  
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 white light composed of 4 colours. *Fusini, A. A. Sc. Lomb. Ven.* 2 (1832) 837-; 12 (1842) 94-.  
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 purple obtained by recombination of 2 colours of solar spectrum. *Koechlin, C. C. R.* 103 (1886) 432-.  
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 —, effect of illumination. *Dove, H. W. Berl. B.* (1852) 69-.  
 —, ————. *Oppel, J. J. (vi Add.) Frkf. Jbr. Ps. Vr.* (1853-54) 44-.  
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 —, —. *Rochas, — de. Midl. Ntlist.* 8 (1885) 141.  
 —, —. *Gheyn, (le rév. père) — van den. Brux. S. Sc. A.* 9 (1885) (*Pt. 1*) 69-.  
 —, —. *Gruber, É. Rv. Sc.* 51 (1893) 394-.  
 —, —. *Wallian, S. S. Science* 21 (1893) 360.  
 —, — in the blind. *Philippe, J. Rv. Sc.* 1 (1894) 806-.

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*Davies, J. A.* [1861] *Edinb. N. Ph. J.* 15 (1862) 187-.  
 brightness. *König, A. A. Ps. C. (Berl. Ps. Gs. Vh.* 1892) 45 (1892) 604-.  
 changes in tone from fatigue of retina by homogeneous light. *Hess, C. Arch. f. Oph.* 36 (1890) (*Ab. 1*) 1-.  
 discrimination by normal eye. *Uthoff, W. Arch. f. Oph.* 34 (1888) (*Ab. 4*) 1-.  
 influence of threshold of visibility. *Ebert, H. A. Ps. C.* 33 (1888) 186-.  
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 —. *Helmholtz, H. Pogg. A.* 94 (1855) 1-.  
 —. *Frey, M. von, & Kries, J. von. Arch. An. Pl. (Pl. Ab.)* (1881) 336-.  
 and their mixtures, apparatus for study of luminous and chromatic intensities. *Pari-naud, —. Par. S. Ps. Sé.* (1884) 206-.  
 number and brightness. *König, A. Z. Psychol.* 8 (1895) 375-.  
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 sensitiveness of eye to. *Lamansky, S. A. Ps. C.* 143 (1871) 633-.

- sensitiveness of eye to. *Meslin, G.* [1899] *Mntp. Ac. Mm.* 2 (1900) 429-.
- visibility limits. *Abney, (Capt.) W. de W.* *R. S. P.* 49 (1891) 509-.
- stereoscopic combination. *Rood, O. N.* *Am. J. Sc.* 39 (1865) 254-.
- unequal visibility at twilight and unequal actinic properties in full daylight. *Keller, F. A. E.* *C. R.* 69 (1869) 278-.
- 1st visible, of incandescent iron. *Noble, A.* *Nt.* 45 (1892) 484-.
- — — — — *Porter, T. C.* *Nt.* 45 (1892) 558-.
- yellow. *Monro, C. J.* *Nt.* 3 (1871) 246-.
- (mixed red and green), and spectral yellow, comparisons. *Donders, F. C.* *Donders Ndl. Gast. Oogl. Vs.* 24 (1883) 147-.
- Development of colour perception in children. *Magnus, H.* *Humb.* 3 (1884) 1-.
- Efficiency of eye in photometry. *Broca, A.* *Par. S. Ps. Sé.* (1894) 119-; *Éclair. Élect.* 6 (1896) 23-.
- Emissive power of incipient glow, Weber's experiments. *Knies, M.* *D. Nf. Tbl.* (1889) 217-.
- Energy and vision. *Langley, S. P.* *Wash. Nat. Ac. Mm.* 5 (1891) 7-.
- Erythroscopie and melanoscopie. *Lommel, E.* *Erlang. Sb. Ps. Md. S.* 3 (1871) 102-; *A. Ps. C.* 143 (1871) 483-.
- Experiments. *Rayleigh, (Lord).* *Nt.* 3 (1871) 234-; 25 (1882) 64-.
- *Mentz, P.* *Ph. Stud.* 13 (1898) 481-.
- , and photo-voltaic theory of vision. *Burton, C. V.* [1888] *Camb. Ph. S. P.* 6 (1889) 308-.
- Fatigue phenomena, certain, incompatibility with three-fibre theory. *Hess, C.* *Arch. f. Oph.* 39 (1893) (*Ab.* 2) 45-.
- Illusions. *Oppel, J. J.* (xii) *Frkf. a. M. Ps. Vr. Jbr.* (1869-70) 96-.
- Indirect vision. *Fick, A.* *Pfüg. Arch. Pl.* 47 (1890) 274-.
- — — *Kirschmann, A.* *Ph. Stud.* 8 (1893) 592-.
- — — *Hellpach, W.* *Ph. Stud.* 15 (1900) 524-.
- Invisibility of rays of wave-length greater than red and less than violet of spectrum. *Czermak, J. N.* (vi *Adds.*) *Böhm. Gs. Ab.* 9 (1857) (*Sect. B.*) 27-.
- Leucoscope for testing. *König, A.* *A. Ps. C.* 17 (1882) 990-.
- Light and colour in direct and indirect vision. *Charpentier, A., & Landolt, E.* *C. R.* 86 (1878) 495-.
- — —, measurement. *Lovibond, J. W.* *Mcr. S. J.* (1893) 275-.
- — — sensations, relation between intensity. *Henry, C.* *C. R.* 115 (1892) 811-.
- — —, theory. *Kries, J. von, & Brauneck,* *Arch. An. Pl. (Pl. Ab.)* (1885) 79-.
- — — — — *Wundt, W.* *Ph. Stud.* 4 (1888) 311-.
- — — — — *Franklin, (Mrs.) C. L.* [1892-98] *J. H. Un. Cir.* [12 (1892-98)] 108-; *Science* 22 (1893) 80-; *Nt.* 49 (1893-94) 394; *Am. As. P.* (1898) 473-.
- Light and colour sensations, theory. *Lechals, G.* *Rv. Quest. Sc.* 45 (1899) 478-.
- — —, unnoticed phenomena. *Gilbert, L. W.* *Gilbert A.* 30 (1808) 242-.
- — shadow, nature. *Reade, J.* *Ph. Mg.* 5 (1829) 109-.
- Mean colour of many-coloured surface, determination. *Petrushevskii, T. T.* (xii) *Rs. Ps.-C. S. J.* 15 (*Ps., Pt. 1*) (1883) 118-; *J. de Ps.* 3 (1884) 460-.
- Mutual action of both eyes. *Gazzaniga, C. L.* *Bb. It.* 62 (1831) 349-.
- Optics of trichromatic photography. *Ives, F. E.* [1900] *Phot. J.* 25 (1902) 99-.
- Phenomena. *Charpentier, A.* *Nancy S. Sc. Bll.* (1884) xxix-, xxxii-.
- Quantity of light necessary. *Charpentier, A.* *C. R.* 92 (1881) 92-.
- Red and grey luminosity. *Lummer, O. A.* *Ps. C.* 62 (1897) 14-.
- Retardation in perception of different colours. *Charpentier, A.* *C. R.* 114 (1892) 1423-.

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- Gorham, J.* *J. Mer. Sc.* 7 (1859) 69-.
- Rood, O. N.* *Silliman J.* 35 (1863) 357-.
- Rosenstiehl, A.* *Par. S. Ps. Sé.* (1877) 120-; *C. R.* 84 (1877) 1133-; 86 (1878) 343-.
- Aitken, J. (of Darroch).* [1878] *Edinb. R. S. P.* 10 (1880) 40-.
- Rosenstiehl, A.* *C. R.* 92 (1881) 244-, 357-.
- Black and white disc, application to tachymetry and ophthalmology. *Henry, C.* *C. B.* 122 (1896) 406-.
- Occasional distinct vision. *Stevell, J. B. A.* *Rp.* (1850) (*pt. 2*) 21-.
- Production of white. *Lüdicke, M. A. F.* *Gilbert A.* 5 (1800) 272-.
- — — *Dove, H. W.* *Pogg. A.* 71 (1847) 97-.
- — — *Oppel, J. J.* *Frkf. Jbr. Ps. Vr.* (1858-59) 57-.
- — — *Govi, G.* *Rm. B. Ac. Linc. T.* 7 (1883) 164-.
- Rotating prism, production of white by. *Duboscq, J.* *Par. S. Ps. Sé.* (1884) 65-.

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- Benham, C. E.* [1894] *Nt.* 51 (1894-95) 113-.
- (Benham.) *Liveing, G. D.* [1894] *Camb. Ph. S. P.* 8 (1895) 249-.
- (Liveing.) *Benham, C. E.* [1894] *Nt.* 51 (1894-95) 200.
- (Benham.) *Liveing, G. D.* [1894] *Nt.* 51 (1894-95) 200.
- Abney, (Capt.) W. de W.* *Nt.* 51 (1894-95) 292.
- (Benham.) *Finnegan, J. M., & Moore, B.* *Nt.* 51 (1894-95) 292-.
- (Finnegan & Moore.) *Benham, C. E.* *Nt.* 51 (1894-95) 321.
- Edridge-Green, F. W.* *Nt.* 51 (1894-95) 321.
- Hurst, C. H.* *Nt.* 51 (1894-95) 510.
- (Benham.) *Snellen, —.* [1895] *A. d'Ocul.* 115 (1896) 51-.
- Turner, D.* [1895] *Sc. S. Arts T.* 14 (1898) 50-.
- (Benham.) *Vogel, H. W.* *Berl. Ps. Gs. Vh.* (1895) 45-.



- (Benham.) *Snellen, H.* Ndl. Gast. Oogl. Vs. 37 (1896) (Ndl. Ooghk. Bijdr.) 35-.
- Bidwell, S.* [1897] R. I. P. 15 (1899) 354-.
- (Benham & Bidwell.) *Hess, —.* [1899] Danzig Schr. 10 (1899-1902) (*Hft.* 2 & 3) xxxvi-.
- Stereoscopy by disparate colour discrimination. *Eindhoven, W.* Arch. f. Oph. 31 (1885) (*Ab.* 3) 211-; Ndl. Gast. Oogl. Vs. 27 (1886) 1-; Arch. Néerl. 20 (1886) 361-.

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- Crum, W.* Mulhouse S. In. Bll. 4 (1831) 544-.
- Botzenhart, —.* Grunert Arch. 8 (1846) 318-.
- Müller, J. J.* Arch. f. Oph. 15 (1869) (*Ab.* 2) 208-.
- Grosse, W.* Cztg. Opt. 9 (1888) 256-.
- Preobraženskij, P.* [1889] Rs. Ps.-C. S. J. 21 (*Ps.*) (1889) 249-; J. de Ps. 9 (1890) 538-; Mosc. S. Sc. Bll. 65 (*No.* 1) (1890) 17.
- Ebbinghaus, H.* [1892-93] Z. Psychol. 5 (1893) 145-.
- Dufton, A.* [1893] S. Dyers Col. J. 10 (1894) 3-, 22-.
- Koster, W.* Arch. f. Oph. 41 (1895) (*Ab.* 4) 1-.
- Kries, J. von.* Z. Psychol. 19 (1899) 175-.
- application to colour photography. *Abney, (Capt.) W. de W.* [1898] R. I. P. 15 (1899) 802-.
- industries. *Rosenthal, I.* Bv. Sc. 17 (1879) 316-.
- Crum's. Marx, C. M.* Schweigger J. 63 (= *Jb.* 3) (1831) 54-.
- Goethe's. Anon.* (vi 43) A. C. 79 (1811) 199-.
- *Hantzsch, C. A.* (vii) Dresden Sb. Isis (1862) 164-.
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- Transparency of eye for dark rays. *Pettinelli, P.* Bv. Sc.-Ind. 28 (1896) 61-.
- Trichromatic theory of optic nerve. *Durand (de Gros), J. P.* C. R. 121 (1895) 1165-.
- Ultra-violet rays, invisibility, experiments to ascertain cause. *Widmark, J.* Stockh. Öfv. (1897) 287-; Fachr. Ps. (1899) (*Ab.* 2) 56-.
- , visibility. *Mascart, É.* C. R. 68 (1869) 402-.
- , —. *Sekulić, M.* A. Pa. C. 146 (1872) 157-.
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- Tomlinson, C.* Thomson Rc. 2 (1835) 21-.
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- Plateau, J. A. F.* Pogg. A. 38 (1836) 626-; Quetelet Cor. Mth. 9 (1837) 97-.
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- Dove, H. W.* Pogg. A. 45 (1838) 158-.
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- Bidwell, S.* Nt. 55 (1896-97) 367-; 56 (1897) 128.
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- Hering, E. Pfüg. Arch. Pl. 41 (1887) 29-, 397. (Hering.) Kries, J. von. Pfüg. Arch. Pl. 41 (1887) 389-.
- Rood, O. N. Sch. Mines Q. N. Y. 8 (1887) 307-.
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- , metrical researches. Pretori, H., & Sachs, M. Pfüg. Arch. Pl. 60 (1895) 71-.
- , phenomena. Mayer, A. M. Am. J. Sc. 46 (1893) 1-.
- , produced by reflection of moon in sea. Martins, C. C. R. 43 (1856) 763-.
- , quantitative relations. Kirschmann, A. Ph. Stud. 6 (1891) 417-.
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- green colour of setting sun. Hornstein, —. Kassel Vr. Nt. B. 34 & 35 (1899) lxii.
- ray, its pure subjectivity. Guebbard, —. Par. S. Ps. Sé. (1899) 41<sup>e</sup>-.
- induction. Aars, K. Birch-Reichenwald. Christiania Skr. (Mth.-Nt. Kl.) (1895) No. 3, 15 pp.
- and lustre. Paalsow, A. Berl. B. (1857) 390-.
- method of producing. Splittgerber, D. C. Pogg. A. 49 (1840) 587-.
- mixture. Aars, K. Birch-Reichenwald. Christiania Skr. (Mth.-Nt. Kl.) (1897) No. 8, 34 pp.
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- Wartmann, É. [1840-48] Gen. Mm. S. Ps. 10 (1843) 273-; 12 (1849) 183-.
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- Tyndall, J.* Ph. Mg. 11 (1856) 329-.
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- Oppel, J. J.* (xii) Frkf. a. M. Ps. Vr. Jbr. (1861-62) 43-.
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- Moigno, F.* Smiths. Rp. (1866) 211-.
- Holmgren, A. F.* [1880] R. S. P. 31 (1881) 302-.
- König, Ar.* [1884] Arch. An. Pl. (Pl. Ab.) (1885) 160-.
- Knies, M.* [1887-88] Arch. Augenh. 17 (1887) 379-; 18 (1888) 50-; 19 (1889) 253-.
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- , system. *Weijde, A. J. van der.* Arch. f. Oph. 28 (1882) (Ab. 2) 1-.
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- Brewster, (Sir) D.* *Ph. Mg.* 17 (1859) 323-; *C. R.* 48 (1859) 614-.
- Lang, V. von.* *A. Ps. C.* 123 (1864) 140-.
- cause. *Haidinger, W.* *Wien SB.* (1848) 485-; *Pogg. A.* 91 (1854) 591-.
- colour. *Haidinger, W.* *Wien SB.* (1851) (Ab. 2) 389-.
- duration of impressions on retina. *Haidinger, W.* *Wien SB.* 12 (1854) 678-.
- nature. [*Brewster, (Sir) D.* non] *Haidinger, W.* *Wien SB.* (1850) (Ab. 2) 442-.
- *Haidinger, W.* *Wien SB.* 12 (1854) 758-.
- and reflection in interior of eye. *Geigel, R.* *A. Ps. C.* 34 (1868) 347-.
- theories, various. *Haidinger, W.* *Haidinger B.* 5 (1849) 42-.
- theory. *Power, J.* [1857] (viii) *Camb. Ph. S. P.* 1 (1866) 179-.
- Images, inverted. *Lallemand*, —. *Rouen Tr. Ac.* (1856-57) 143-.
- , explanation. *Bartels, C. M. N.* *Oken Isis* (1834) 585-.
- , modification. *Haldat du Lys, C. N. A. de.* *Nancy Mm. S. Sc.* (1850) 209-.
- , multiple, in one eye. *Eval'd, T. T.* (xii) *Rs. C. Ps. S. J.* 8 (Ps.) (1876) [Pt. 1] 104-.
- , retinal, experiment showing reality. *Rogers, W. I.* [1895] *Nt.* 53 (1895-96) 108.
- , —, primary, secondary, and tertiary, with instantaneous light stimuli. *Boscha, H. P.* *Arch. f. Oph.* 40 (1894) (Ab. 1) 22-.
- , —, —, —, —, —, — (Bosscha). *Hess, C.* *Arch. f. Oph.* 40 (1894) (Ab. 1) 337-.
- , spectral, of rotating vacuum tube. *Bidwell, S.* *Nt.* 32 (1885) 30-.
- , successive, physical theory. *Warlomont, L.* *A. d'Ocul.* 1 (1869) 281-.
- Internal fringes, produced by interference in eye itself. *Lovering, J.* *Am. As. P.* (1853) 23-.
- Inversions on continued observation of perspective designs and transparent bodies. *Dove, H. W.* *Berl. Mb.* (1867) 84-.
- Light perception, duration. *Charpentier, A.* *C. R.* 95 (1882) 96-.
- in indirect vision. *Kirschmann, A.* *Ph. Stud.* 5 (1889) 447-.
- Light phenomenon. *Willigen, V. S. M. van der.* *Pogg. A.* 103 (1857) 175-.
- —. *Zeeman, P.* *Amst. Ak. Vs.* [1] (1893) 164-; *Z. Psychol.* 6 (1894) 233-.
- sensation, intensity. *Henry, C.* *C. R.* 122 (1896) 1189-, 1232.
- Optical estimation of reflections from spectacle glasses. *Szili, A.* *Arch. f. Oph.* 38 (1892) (Ab. 4) 12-.
- Penetrating power of eye, and size of retinal elements. *Meslin, G.* *J. de Ps.* 1 (1892) 74-.
- Perception, visual, objective and subjective, phenomena. *Dubrunfaut*, —. *C. R.* 73 (1871) 752-.
- , —, pseudo-entoptic. *Laqueur, L.* *Arch. f. Oph.* 36 (1890) (Ab. 1) 62-.
- Persistence of vision. *Montigny, C.* *Bruz. Mm. Cour.* 4°, 24 (1850-51) 30 pp.
- — — (Montigny). *Plateau, J. A. F.* [1852] *Moigno Cosmos* 2 (1852-53) 18-.
- — —. *Moigno, F.* *Smiths. Rp.* (1866) 211-.
- — —. *Tobin, T. W.* *Franklin I. J.* 78 (1879) 330-.
- — —. *Charpentier, A.* *C. R.* 114 (1892) 1180-.
- — —. *Berget*, —. *Par. S. Ps. Sé.* (1893) 283.
- — —, experiments. *Gariel, C. M.* *Par. S. Ps. Sé.* (1876) 201-.
- — —, —. *Marbe, K.* *Ph. Stud.* 9 (1894) 384-.
- — —, — with alternating current machine. *Ritter, W.* *Z. Psychol.* 11 (1896) 310-.
- — —, —, principle of thaumatrope. *Jeffries, B. J.* *Am. Oph. S. T.* 5 (1869) 98-.
- — — in relation to rapid visual signalling. *Bruce, E. S.* *Un. Serv. I. J.* 43 (1899) 264-.
- — — for various wave-lengths. *Allen, F.* *Ps. Rv.* 11 (1900) 257-.
- Polarising structure of eye. *Brewster, (Sir) D.* *B. A. Rp.* (1850) (pt. 2) 5-.
- Prismatic colour-phenomena without a prism. *Mollweide, C.* *Gilbert A.* 17 (1804) 328-.
- Pupil, reaction time on stimulation of sympathetic. *Langendorff*, —. *Meckl. Vr. Nt. Arch.* (1896) xvi-.
- Purkinje's phenomenon. *Nicati, W., & Macé de Lépinay, J.* *J. de Ps.* 1 (1882) 33-.
- —. *Hering, E.* *Pfäg. Arch. Pl.* 60 (1895) 519-.
- —. *Sherman, F. D.* *Ph. Stud.* 18 (1898) 434-.
- Quantity of light necessary to distinguish several sources. *Charpentier, A.* *Nancy S. Sc. Bll.* 6 (14<sup>e</sup> Ann. 1881) (1882) 5-.
- — — — produce light sensation. *Charpentier, A.* *C. R.* 88 (1879) 189-.
- Radiant heat, power of eye to transmit. *Cima, A. Majocchi A. Fis. C.* 3 (1850) 158-; *N. Cim.* 12 (1860) 339-.
- Rays proceeding from light seen with half-closed eyes. *Kries, F.* *Voigt Mg.* 9 (1805) 97-; 10 (1805) 495-.
- — — — — — —. *Vieth, G. U. A.* *Gilbert A.* 19 (1805) 187-, 371-; 22 (1806) 102-.
- — — — — — —. *Sartorius, G. C.* *Voigt Mg.* 11 (1806) 529-.

- Rays proceeding from light seen with half-closed eyes. *Meyer, M. H.* Pogg. A. 89 (1853) 429-; 97 (1856) 233-.
- — — — — *Thomson, J.* [1892] R. S. P. 52 (1893) 70-.
- Reflex vision. *Holmes, (Dr.)*. Am. Ac. P. 4 (1857-60) 373-.
- Refraction, phenomena. *Claudet, A. F. J.* (vii) Ph. Mg. 26 (1863) 324-; C. R. 58 (1864) 89.
- Retina, luminosity. *Helmholtz, H. von.* Berl. Ps. Gs. Vh. (1888) 85-.
- , property. *Brewster, (Sir) D.* [1866] Edinb. R. S. T. 24 (1867) 327-.
- , —. *Rood, O. N.* Am. J. Sc. 13 (1877) 32-.
- , unequal fatigue of central and peripheral part. *Erdmann, E. O.* Berl. Ps. Gs. Vh. (1884) 11.
- , violet illumination, due to light waves. *Charpentier, A.* C. R. 92 (1881) 355-.
- Retinal impressions, mode of reviving dormant. *Grove, W. R.* Ph. Mg. 3 (1852) 435-.
- , time-lag. *Mascart, M.* C. R. 113 (1891) 180-.
- oscillations. *Charpentier, A.* C. R. 113 (1891) 217-; 122 (1896) 87-.
- , transverse. *Charpentier, A.* C. R. 122 (1896) 535-.
- Skiascopy and luminosity of eye. *Plaats, J. D. van der.* Utr. Prv. Gn. Aant. (1899) 24-.
- Spot in field of view, related to Mariotte's spot. *Prevost, P.* Bb. Un. 52 (1833) 337-.
- Star rays. *Le Conte, J.* Science 9 (1887) 14.
- and sun corona. *Randolph, R.* Science 8 (1886) 566.
- — — — — *Stevens, W. Le C.* Science 9 (1887) 34.
- Stroboscopic experiments, simple method of making visible to a number. *Lommel, E. C. J.* Carl Rpm. 17 (1881) 463.
- Vibration of eye-ball as remedy for overstrain (illustration of electrical theory of vision). *Obach, E.* Nt. 50 (1894) 172, 199.
- Visibility of luminous points. *Charpentier, A.* C. R. 95 (1882) 148-.
- Visual purple, ophthalmoscopy. *Abelsdorff, G.* Z. Psychol. 14 (1897) 77-.
- Contra-reflectors. *Reich, —.* [1895] Arch. Augenh. 16 (1886) 437.
- Corneal microscope. *Nachet, —.* Mer. S. J. 6 (1886) 676.
- — — — — *Schanz, F.* Arch. Augenh. 31 (1895) 265-; Arch. Oph. 27 (1898) 634-.
- —, binocular. *Czapski, S.* Arch. f. Oph. 48 (1899) 229-.
- —, Schieck's. *Anon.* Mer. S. J. 4 (1884) 954.
- Diascope. *Gorham, J. J.* Mer. Sc. 2 (1854) 218-; 3 (1855) 1-; 4 (1856) 27-.
- , Gorham's, and vision through small apertures. *Oppel, J. J.* (vi *Adds.*) Frkf. Jbr. Ps. Vr. (1856-57) 37-.
- Direct vision spectroscope, use in testing achromatism, etc. *Zenger, C. V.* C. R. 101 (1885) 1003-.
- Focal length of eye, measurement. *Hirschberg, —.* D. Nf. Tbl. (\*1874) 105.
- Interior of eye seen by reflection in telescope. *H[ussey], A. M.* (vi *Adds.*) Ph. Mg. 1 (1832) 318-.
- Ophthalmoleucoscope, simple. *König, Ar.* Berl. Ps. Gs. Vh. (1884) 41-.
- Ophthalmological apparatus. *Dimmer, F.* [1896] Arch. Augenh. 34 (1897) 1-; Arch. Oph. 28 (1899) 494-.
- Ophthalmometer. *Leroy, C. J. A., & Dubois, R.* Par. S. Ps. Sé. (1888) 203-; Par. S. Bl. Mm. 40 (1888) (C. R.) 429-.
- *Kayser, E.* [1890] Danzig Schr. 7 (1888-91) (Heft 4) xiii-.
- , construction and theory. *König, Ar.* (xii) Z. Instk. 3 (1883) 153-.
- , Helmholtz's. *Meyerstein, M.* Pogg. A. 111 (1860) 415-.
- , —, graduation. *Albertotti, G.* Tor. Ac. Sc. At. 17 (1881) 596-.
- , Javal's. *Schneller, —.* [1890] Danzig Schr. 7 (1888-91) (Heft 4) xii-.
- , —. *Speakman, H. D.* Arch. Oph. 19 (1890) 76-.
- , —, modification. *Weiland, C.* Arch. Oph. 24 (1895) 340-; Arch. Augenh. 32 (1896) 128-.
- , Kagenaar's. *Holth, S.* Arch. Augenh. 41 (1900) 175-.
- , portable. *Reid, T. R. S. P.* 53 (1893) 1-.
- Ophthalmometry. *Bliz, M. G.* [1881] (xii) Ups. Läk. F. 17 (1882) 98-.
- *Javal, —.* Wien Md. Wschr. 33 (1888) 1250-.
- Ophthalmoscope. *Meyerstein, M.* Henle u. Pfeufer Z. 4 (1854) 310-, 311-.
- *Schlaefke, —.* Kassel Vr. Nt. B. 31 (1884) 39-.
- *Baas, J. H.* Humb. 4 (1885) 180-.
- , binocular. *Giraud-Teulon, —.* C. R. 52 (1861) 646-.
- , electric. *Schweigger, —.* Arch. An. Pl. (Pl. Ab.) (1889) 365-.
- , fixed. *Thorner, W.* Arch. An. Pl. (Pl. Ab.) (1899) (Suppl.) 564-; Z. Psychol. 20 (1899) 294-.
- , Helmholtz-Wecker. *Masselon, J. A.* d'Ocul. 98 (1887) 24-.

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- Aberroscope. *Tscherning, M.* [1894-1900] Par. S. Ps. Sé. (1894) 241-; Sc. Abs. 4 (1901) 581.
- Astigmometer, application and theory. *Straubel, R.* A. Ps. C. 64 (1898) 794-.
- , Stokes's lens as. *Dennett, W. S.* Am. Oph. S. T. (1885) 106-.
- Astigmometry. *Hintzy, C.* Arch. Md. Phm. Mil. 14 (1889) 201-.
- Centering instrument. *Smith, A. L.* Arch. Oph. 20 (1891) 266-.
- *Bumstead, S. J.* Arch. Oph. 23 (1894) 88-; Arch. Augenh. 30 (1895) 66-.
- Ceratroscope. *Berger, E.* (xii) Z. Instk. 2 (1882) 389-.

- Ophthalmoscope, micrometer for. *Szilágyi, E.* Mth. Term. Éts. 4 (1886) 84-; Mth. Nt. B. Ung. 4 (1885-86) 62-.
- , modified form, with cylinders. *Risley, S. D.* Am. Oph. S. T. (1887) 587-.
- optometer. *Parent, H. A.* d'Ocul. 107 (1892) 195-.
- , refraction-. *Berger, E.* Z. Instk. 5 (1885) 77-.
- , —. *Borthen, L.* Int. Md. Cg. Vh. (1890) (Bd. 4, Ab. 10) 66.
- , —, with cylindrical lenses. *Burnett, S. M.* Am. Oph. S. T. (1887) 589-.
- , —, lens series for. *Jackson, E.* Am. Oph. S. T. (1886) 361-.
- , stereoscopic. *Thorner, W.* [1900] Arch. Augenh. 42 (1901) 78-.
- Ophthalmoscopy. *Dimmer, F.* Arch. f. Oph. 38 (1892) (Ab. 4) 19-; 44 (1897) 1-.
- , binocular. *Giraud-Teulon, —.* A. d'Ocul. 45 (1861) 233-.
- Ophthalmotonometric studies. *Ostwald, F.* Arch. f. Oph. 40 (1894) (Ab. 5) 22-.
- Optical bench. *Sandoz, A.* Par. S. Ps. Sé. (1894) 228-.
- type. *Albertotti, G.* Mod. Ac. Sc. Mm. 10 (1894) 449-.
- Optometer. *Hoh, T.* (XII) Bamb. Nf. Gs. B. (12) (1882) (No. 7) 2 pp.
- , *Laurenty, K.* St. Pet. Md. Wschr. 17 (1892) 191-.
- , direct-reading, precision in. *Guébbard, —.* As. Fr. C. R. (1892) (Pt. 1) 178.
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- , shadow-. *Douglas, J. C.* Ph. Mg. 37 (1869) 340-.
- , — (Douglas). *Templeton, R.* Ph. Mg. 39 (1870) 9-.
- , — (Templeton). *Douglas, J. C.* Ph. Mg. 40 (1870) 540-.
- , skiascope-. *Sureau, H.* C. R. 118 (1894) 1253-.
- Optometry. *Nimier, H.* Arch. Md. Phm. Mil. 18 (1891) 47-.
- , keratocopy or skiascopy. *Bertelé, —.* Arch. Md. Phm. Mil. 23 (1894) 165-.
- , objective. *Kramsztyk, Z.* Par. T. Nauk Śc. Pam. 11 (\*1879) Art. 2, 46 pp.
- , —. *Parent, —.* A. d'Ocul. 113 (1895) 321-.
- , practical application. *Leonhardt, G.* Lplidina. 18 (1882) 170-.
- Perimeter. *Dyer, E.* Am. Oph. S. T. (1884) 686-.
- , *Braunschweig, P.* Z. Instk. 11 (1891) 58-.
- , *Epstein, S. S.* Z. Instk. 15 (1895) 400-.
- Photography, use in eye disease. *Cohn, H.* Bresl. Schl. Gs. Jbr. (1890) (Al. B.) 30.
- Photometer, Weber's. *Cohn, —.* [1886] Arch. Augenh. 17 (1887) 57-.
- Photometry. *Charpentier, A.* Nancy S. Sc. Bll. 6 (16<sup>e</sup> Ann. 1883) (1884) xxvi-.
- Photometric apparatus. *Kirschmann, A.* Ph. Stud. 5 (1889) 292-.
- Prismometer, perfected. *Prentice, C. F.* Arch. Oph. 20 (1891) 109-.
- Prisms, numbering. *Dennett, W. S.* Am. Oph. S. T. (1889) 422-.
- , —. *Landolt, E.* [1890] Arch. Augenh. 22 (1891) 235-; Arch. Oph. 19 (1890) 497-.
- , —. *Duane, A.* Arch. Oph. 20 (1891) 321-, 596.
- , — by degree of refractive power. *Jackson, E., Burnett, S. M., & Noyes, H. D.* Am. Oph. S. T. (1888) 150-.
- , — and measuring. *Prentice, C. F.* A. d'Ocul. 108 (1892) 5-.
- , — — by metric system. *Prentice, C. F.* Arch. Oph. 19 (1890) 64-, 128-; Arch. Augenh. 23 (1891) 215-.
- , refractive value, etc. *Weiland, C.* Arch. Oph. 23 (1893) 435-; 23 (1894) 28-.
- , triple rotatory variable. *Jackson, E.* Arch. Oph. 23 (1894) 116-; Arch. Augenh. 30 (1895) 68-.
- Projections for clinical teaching, simple mode of procuring. *Eversbusch, O.* Arch. f. Oph. 50 (1900) 161-.
- Pupillometry and photometry. *Henry, C.* Lum. Élect. 52 (1894) 451-, 510-, 614-; Éclair. Élect. 1 (1894) 337-, 529-, 673-.
- Refraction by crossed cylinders, models to illustrate. *Burnett, S. M.* Am. Oph. S. T. (1888) 112-.
- Retina, observation by Galileian telescope. *Lami, —.* Rv. Sc.-Ind. 32 (1900) 212.
- , photography. *Guinkoff, V. C.* R. 122 (1896) 1017-.
- Retinal telescope. *Schanz, F.* Arch. Augenh. 31 (1895) 265-; Arch. Oph. 27 (1898) 634-.
- , —. *Czapski, —.* D. Nf. Vh. (1895) (Th. 2, Hälfte 2) 196-.
- Schematic apparatus for demonstration of static refraction. *Pedrazzoli, —.* [1898] Arch. Augenh. 19 (1899) 482-.
- Scotometer. *Antonelli, —.* Arch. Augenh. 27 (1893) (Ber. 1893, 11).
- Sideroscope. *Asmus, E.* Arch. f. Oph. 40 (1894) (Ab. 1) 290-.
- , Asmus's, modification. *Bjerke, K.* Arch. f. Oph. 51 (1900) 461-.
- Sight testing apparatus. *Oliver, C. A.* Am. Oph. S. T. (1885) 130-.
- , —. *Dennett, W. S.* Am. Oph. S. T. (1885) 133-; (1886) 245-.
- , —. *Plehn, F.* Z. Instk. 5 (1885) 53-.
- , —. *Carl, A.* [1891] Arch. Augenh. 24 (1892) 41-.
- Stereophotochromoscope. *Harris, D. F.* [1895-96] Glasg. Ph. S. P. 27 (1896) 14-; J. An. Pl. 30 (1896) 118-.
- Tachistoscopic measurements. *Wundt, W.* Ph. Stud. 15 (1900) 287-; 16 (1900) 61-.
- Tonometer. *Gradientgo, P.* [1899] Ven. I. At. (1899-1900) (Pt. 2) 203-.
- Tonometry and manometry. *Koster, W.* Arch. f. Oph. 41 (1895) (Ab. 2) 113-, (Ab. 4) 274-.
- , — (Koster). *Ostwald, F.* Arch. f. Oph. 41 (1895) (Ab. 3) 264-.
- , —, —. *Ischreyt, G.* Arch. f. Oph. 48 (1899) 694-.

## 8990 Vibration and Sound

### VIBRATION AND SOUND.

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- Seebeck, A.* Rpm. Ps. 6 (1842) 1-; 8 (1849) (pte. 2) 1-.
- Dove, H. W.* (vi *Adds.*) Berl. Pol. Gs. Vh. 15 (1854) 66-.
- Györy, S.* [1858] Évk. 9 (1860) No. 3, 1-.
- Volpicelli, P.* Rm. At. 11 (1857-58) 168.
- Stricker, W.* A. Ps. C. 121 (1864) 335-.
- Newall, H. F.* [1875] Rugby NH. S. Rp. (1876) 33-.
- Apparatus. *Appun, —.* D. Nf. Tbl. (\*1872) 206.
- for lectures. *Maschke, H.* A. Ps. C. 13 (1881) 204-.
- Earthquakes, phenomena. *Milne, J.* [1887] Jap. Seism. S. T. 12 (1888) 53-, 107-.
- Experiments. *Loesche, (Dr.) —.* Dresden Sb. Nt. Heilk. (1868-69) 114-.
- Instrument. *Uttini, G.* [1806] Bologna Mm. I. It. 2 (1808) 227-.
- Modern problems. *Wead, C. K.* [1900] Wash. Ph. S. Bll. 14 (1906) 129-.
- Phenomena, explanation of certain. *Rayleigh, (Lord).* [1878] R. I. P. 8 (1879) 536-.
- Sound and light, analogy. *Barrett, W. F.* QJ. Sc. 7 (1870) 1-.
- — —, experiments, etc. *Young, (Dr.) T.* Phil. Trans. (1800) 106-; *Nicholson J. 5* (1802) 161-.
- — —, vibrations. *Markiewicz, R.* Krk. Roczn. Uniwers. 14 (1831) 293-.
- Sources of sound. *Gleue, —.* [1895] Lüneb. Nt. Vr. Jh. 14 (1898) vii-.
- Vulcanism. *Arrhenius, S.* Stockh. Gl. För. F. 22 (1900) 395-.

### KINEMATICS OF VIBRATIONS AND WAVE-MOTIONS.

#### 9000 General.

- Elastic media, classification, and laws of plane waves in them. *Haughton, S.* [1849] Ir. Ac. T. 22 (1855) 97-.
- Mechanical theory of sound. *Grinwis, C. H. C.* Amst. Ak. Vs. M. 8 (1874) 133-; Arch. Néerl. 10 (1875) 135-.
- Motion of piston and of air in cylinder. *Stokes, G. G.* Camb. Mth. J. 4 (1845) 28-.
- , propagation in elastic fluids. *Poisson, S. D.* A. C. 22 (1823) 246-.
- — — media. *Challis, J.* Ph. Mg. 7 (1830) 325-.
- — — — —. *Poisson, S. D.* [1880] Par. Mm. Ac. Sc. 10 (1831) 549-.
- — — — —. *Cellérier, C.* Gen. S. Ps. Mm. 27 (1881) 12-.

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- Motion, propagation in fluid. *Hugoniot, H.* C. R. 101 (1885) 1118-, 1229-; Liouv. J. Mth. 3 (1887) 477-; 4 (1888) 153-.
- — — — —, Hugoniot's and analogous theorems. *Duhem, P.* C. R. 131 (1900) 1171-.
- — — — — solids and gases. *Hugoniot, H.* C. R. 101 (1885) 794-; Par. Éc. Pol. J. 57 (1887) 8-; 58 (1889) 1-.
- — — — — liquids. *Wertheim, G.* C. R. 29 (1849) 697-; A. C. 31 (1851) 19-.
- of superposed elastic fluids. *Poisson, S. D.* [1823] Par. Mm. Ac. So. 10 (1831) 317-.
- Motions, progressive, produced by vibrations. *Puschl, K.* Wien SB. 9 (1852) 173-.
- Point-, line-, and plane-sources of sound. *Rayleigh, (Lord).* [1888] L. Mth. S. P. 19 (1889) 504-.
- Running water, sound of, physical cause. *Wintrich, (Prof.) —.* Erlang. Sb. Ps. Md. S. 4 (1872) 74-.
- Vibrating system, fundamental modes. *Rayleigh, (Lord).* Ph. Mg. 46 (1873) 434-.
- systems, elementary notions. *Armagnat, H.* Éclair. Élect. 7 (1896) 395-, 446-.
- Vibrations under action of variable forces. *Seebeck, A.* Pogg. A. 62 (1844) 289-.
- of approximately simple systems. *Rayleigh, (Lord).* Ph. Mg. 46 (1873) 357-.
- in elastic fluid, theory. *Challis, J.* Ph. Mg. 24 (1862) 135-, 291-.
- — — medium, laws. *Umov, N. A.* (xii) Rec. Mth. (Moscou) 5 (1870) (Pt. 1) 189-, 252-.
- — — — —, small, integration of equations. *Popoff, A.* Mosc. S. Nt. Bll. 26 (1853) 342-.
- — extended media. *Robinson, S. W.* Franklin I. J. 81 (1881) 201-.
- — isotropic medium. *Clavenad, —.* Lum. Élect. 47 (1893) 272-.
- — — — —, theorems, general. *Rayleigh, (Lord).* L. Mth. S. P. 4 (1871-73) 357-.
- — — — —, theory. *Ménabréa, L. F.* [1853] Tor. Mm. Ac. 15 (1855) 205-.
- Wave motion in air when velocities of molecules are not very small. *Piana, G.* Turin Mm. Ac. (1811-12) 485-.
- — — — —, theory. *Blanchet, P. H.* C. R. 13 (1841) 958-.
- propagation. *Stoney, G. J.* [1859-60] B. A. Rp. (1859) (pt. 2) 9-; Ir. Ac. T. 24 (1871) 37-.
- — and composition of velocities. *Baudrimont, A.* Bordeaux Mm. S. Sc. 3 (cah. 1) (1864) 153-.
- — — — — along connected systems of similar bodies. *Rayleigh, (Lord).* Ph. Mg. 44 (1897) 356-.
- — — — — (longitudinal waves), elementary treatment. *Macgregor, J. G.* [1888] N. Scotia I. Sc. P. & T. 7 (1890) 89-.
- — — — —, plane air waves. *Riemann, B.* [1858] Gött. Ab. 8 (Mth.) (1858-59) 43-.
- — — — — — — — —. *Tumlirz, O. A. A.* (xii) Lotos 29 (1880) 29-; Wien Ak. Sb. 95 (1887) (Ab. 2) 367-.
- — — — — waves. *Haughton, S.* Camb. and Dubl. Mth. J. 8 (1853) 159-; 9 (1854) 129-.
- theory of condensational-rarefactional waves in gases, liquids and solids, etc., continuity in. *Kelvin, (Lord).* B. A. Rp. (1868) 788-.



- Waves, elastic, in rocks, form. *Rudzki, M. P.* [1897-99] *Krk. Ak. (Mt.-Prz.)* Rz. 13 (1898) 377-; 19 [20] (1902) 143-; *Btr. Geops.* 3 (1898) 519-; *Crc. Ao. Sc. Bll.* (1899) 373-.
- in elastic tubes containing incompressible liquids, theory. *Weber, W.* *Leip. B.* 18 (1866) 353-.
- — — — liquid. *Mach, E.* *Moleschott Us.* 10 (1866) 71-.
- , explosion, of gunotton. *Munroe, C. E.* *Am. J. Sc.* 36 (1888) 48-.
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- , molecules and atoms. *Taylor, W. B.* [1872] (xi) *Smiths. Misc. Col.* 20 (1881) *Art.* 1, 66- (*Wash. Ph. S. Bll.* 1 (1874).)

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- Absolute pitch. *Rayleigh, (Lord).* [1877] *Nt.* 17 (1878) 12-.
- Composition and analysis of vibration. *Sluginov, N.* *Kazan Un. Mm.* (1891) (*App.*); (1892) (*App.*); (1893) (*App.*); (1894) (*App.*) 176 pp.
- , optical, of rectangular vibrations. *Mercadier, E.* *Par. S. Ps. Sé.* (1876) 57-.
- of rectangular vibrations. *Barrett, W. F.* *Ph. Mg.* 36 (1868) 217-.
- — —, apparatus for. *Pfaundler, L.* *Wien Sb.* 68 (1873) (*Ab.* 2) 424-.
- — —, —. *Stöhrer, E. (jun.).* *A. Ps.* C. 158 (1876) 615-.
- — —, —, modification of Lissajous's. *Izarn, —.* *As. Fr. C. R.* (1892) (*Pt.* 2) 242-.
- — vibrations. *Johannsen, F.* (xii) *Ts. Mth.* 5 (1875) 137-.
- — —, with perpendicular translation. *Thompson, S. P.* *Ph. Mg.* 9 (1880) 75.
- — —, and sounds of free reeds. *Wolf, C.* *L'I.* 30 (1862) 393-.
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- Curves, vibration-, graphic representation, apparatus for. *Mach, E.* *A. Ps. C.* 129 (1866) 464-.
- , —, theory. *Strzelecki, F. von.* *Wien Sb.* 65 (1872) (*Ab.* 2) 189-.
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- Elements of vibratory motion, determination. *Mercadier, E.* *C. R.* 89 (1879) 736-, 1071-, 1110-; *J. de Ps.* 9 (1880) 41-, 217-, 282-.
- Equation, partial differential, of motion of sound in space. *Brooke, C.* *Crelle J.* 13 (1835) 260-.
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- — — simple vibrations. *Bergmann, J.* *N.-Vorp. Mt.* 18 (1887) 1-; *Bresl. Schl. Gs. Jbr.* (1889) 184-.
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- , universal (for exhibiting vibration curves). *Melde, F.* *Pogg. A.* 115 (1862) 117-; 141 (1870) 320.
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- Lissajous, J.* *C. R.* 41 (1855) 98-, 814-; 43 (1856) 973-; *Par. Bll. S. Encour.* 55 (1856) 699-; *A. C.* 51 (1857) 147-.
- Tyndall, J.* [1857] *R. I. P.* 2 (1854-58) 441-.
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- , improved. *Chandler, C. H.* *Wisc. Ac. T.* 10 (1895) 61-.
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- Methods. *Terquem, A.* J. de Ps. 1 (1872)  
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- Microstroboscopic experiment. *Mach, E.* (xii)  
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- *Mann, J. D.* Manch. Lt. Ph. S. P. 17  
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- , with phase-adjustment. *Crova, A.* As.  
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*Mach, E.* Halle Z. Nw. 40 (1872) 402-,  
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Tuning forks, determination of rate of vibration.  
*Clarke, (Lt.) G. S., & M<sup>c</sup>Leod, H.* [1879]  
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—, König's, and French "diapason normal."  
*Ellis, A. J.* Nt. 16 (1877) 85, 227; 17 (1878)  
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—, standard, vibrations. *König, R.* A. Ps.  
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*Oberbeck, A.* N.-Vorp. Mt. 19 (1888) 84-.

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ducing. *Stern, L. W.* Berl. Ps. Gs. Vh.  
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day, M.* Phil. Trans. (1831) 299-.

— exhibiting motion of vibrating bodies. *Clarke,  
(Lt.) G. S., & M<sup>c</sup>Leod, H.* [1877] R. S. P.  
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Kirchhoff's principle, model to illustrate.  
*Hallock, W.* [1899] N. Y. Ac. A. 12  
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sure changes in vibrating air columns).

*Kundt, A.* A. Ps. C. 134 (1868) 563-.

— (new form). *Bartoniak, G.* Termt. Közl.  
20 (1888) (Suppl.) 140-; Mth. Nt. B. Ung.  
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— (Kundt's). *Trusevič, A. A.* Vars. S. Nt. Tr.  
(1897) (C. R., Ps. C.) Fasc. 3, Mém. 7, 4 pp.

— *Svedelius, G. E.* N. Ts. Fs. K. 3 (1898)  
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— *Merritt, E.* Ps. Rv. 1 (1894) 166-.

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— *Nichols, E. L., & Merritt, E.* Am. As.  
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—, study of hearing trumpet by. *Marage, —.*  
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—, — overtones by. *Doumer, E.* C. R. 105  
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—, — vowels by. *Marage, —.* Par. S. Ps.  
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- Periodic motions, rapid, demonstration and measurement. *Doppler, C.* Böhm. Gs. Ab. 8 (1843-44) 779-.
- Phoneidoscope. *Taylor, S.* Par. S. Ps. Sé. (1878) 177-.
- Phoneidoscopic use of interference rings. *Guéhard, A.* As. Fr. C. B. 8 (1879) 395-; C. R. 89 (1879) 1118-.
- Phonoptometer. *Lissajous, J.* C. R. 76 (1878) 878-; J. de Ps. 3 (1874) 265-.
- Radiophone. *Bell, A. G.* Am. J. Sc. 21 (1881) 463-; C. R. 92 (1881) 1206-.
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- , phonic wheel for regulating. *La Cour, P.* C. B. 87 (1878) 499-; (xii) Sk. Nt. Môt. F. (1880) 133-; Tel. J. 21 (1887) 529.
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- , stroboscopic comparison. *Lippmann, G.* C. R. 104 (1887) 940-; Par. S. Ps. Sé. (1887) 109-.
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- Muncke, G. W.* Pogg. A. 24 (1832) 466-.
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- — —. *Rollmann, W.* Pogg. A. 105 (1858) 620-.
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 —, — — — several. *Blake*, *E. W.* *Am. J. Ot.* 1 (1879) 81-.  
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 —, illustration by. *Diacon*, *É.*, & *Wolf*, —. [1865] *Mntp. Mm. Ac. Sect. Sc.* 6 (1864-66) 235-.  
 —, — of longitudinal and transverse waves by. *Weber*, *R. H.* [1881] *Neuch. S. Sc. Bl.* 13 (1883) 96-.  
 —, optical, of action of telephone. *Frölich*, *O.* *Elekttech. Z.* 8 (1887) 210-.  
 —, —, — vibration curves, with application to telephone, alternating machines, etc. *Frölich*, *O.* *Elekttech. Z.* 10 (1889) 65-.  
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Railway carriages, undulations due to shock. *Resal*, *H. A.* *C. R.* 78 (1874) 521-.  
 Sound, methods of rendering visible. *Wheatstone*, (*Sir*) *C.* *Thomson A. Ph.* 6 (1823) 81-.  
 Stratification of vibrating liquids. *Stefan*, *J.* *Wien Sb.* 65 (1872) (*Ab. 2*) 424-.  
 Stroboscopic illustration of wave-theory. *Müller*, (*Dr.*) *J.* *Pogg. A.* 67 (1846) 271-.  
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*Schulze*, *O.* *Pogg. A.* 100 (1857) 583-.  
*Lang*, *J.* *Brünn Vh.* 6 (1867) (*Ab.*) 153-.  
*Lyman*, *C. S.* *Am. As. P.* 16 (1867) 33-; *Am. J. Sc.* 45 (1868) 394-.  
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*Pfaundler*, —. *D. Nf. Tbl.* (1887) 82.  
*Smith*, *F. J.* *Nt.* 40 (1889) 820.  
*Cheshire*, *F.* *Nt.* 45 (1892) 347-.  
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 mechanical. *Moberg*, *A.* (viii) *Helsingf. Acta* 6 (1861) 569-.  
 for projection. *Weinhold*, *A. F.* *Carl Rpm.* 15 (1879) 458-.  
 — sound and light waves. *Rousseau*, *E.* *Brux. Ac. Bl.* 11 (1861) 507-.  
 — — — water waves. *Snell*, *E. S.* *Silliman J.* 49 (1845) 20-.  
 — — — — —. *Taylor*, *S.* [1880] *Camb. Ph. S. P.* 4 (1883) 18-.

## 9040 Reflection and Refraction of Waves. (See also 9220.)

### REFLECTION.

*Savart*, *N.* *C. R.* 7 (1838) 1068-.  
 (Stationary waves.) *Savart*, *N.* *A. C.* 14 (1845) 385-; *C. R.* 21 (1845) 18-.  
 (—) (Savart.) *Seebeck*, *A.* *Pogg. A.* 67 (1846) 145-; 68 (1846) 465-.

## 9050 Interference and Diffraction of Waves Vibrations, General 9100

- with and without change of phase, method of exhibiting. *Violle, J.* C. R. 103 (1886) 1255-.
- at confines of 2 media between which transition is gradual. *Rayleigh, (Lord).* L. Mth. S. P. 11 (1879-80) 51-.
- dispersion in heterogeneous medium. *Kasterin, N.* Rs. Ps.-C. S. J. 80 (Ps.) (1898) 61-; Amst. Ak. Vs. 6 (1898) 460-, 532.
- of longitudinal waves by a plane. *Schütz, O. E.* Christiania F. (1893) No. 15, 37 pp.
- by paraboloid. *Sharpe, (Rev.) H. J.* QJ. Mth. 15 (1878) 1-; Camb. Ph. S. P. 10 (1900) 101-.
- of sound or light from corrugated surface. *Rayleigh, (Lord).* B. A. Rp. (1893) 690-.
- transverse waves. *Braun, —.* [1873] (ix) Würzb. Ps. Md. Vh. 6 (1874) xv-.
- — — (smallest) in liquids. *Matthiessen, L.* A. Ps. C. 134 (1868) 107-.
- waves in liquids excited by vibrating plates. *Kundt, A.* Berl. Mb. (1868) 125-.
- analytical representation. *Kolděek, F.* Prag Sb. (1894) (Mth.-Nt.) No. 19, 12 pp.
- application to acoustical problems. *Kool, C. J.* Laus. S. Vd. Bll. 31 (1895) 129-.
- and characteristics of partial differential equations. *Coulon, J.* C. R. 130 (1900) 1064-.
- deduction of Descartes' laws from. *Pilčikov, N.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 27-; J. de Ps. 7 (1888) 274-.
- demonstration. *Tedone, O.* Rm. R. Ac. Line. Rd. 5 (1896) (Sem. 1) 357-, 483.
- in isotropic bodies. *Carvalho, E.* C. R. 120 (1895) 88-.
- modification. *Aldis, W. S.* QJ. Mth. 15 (1878) 326-.
- refutation. *Krasvič, K.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 49-, 181-.
- (Kraevič). *Stolžtov, A. G.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 180-.
- (—). *Schiller, N.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 184-.
- residual integral. *Hadamard, —.* Par. S. Mth. Bll. 28 (1900) 69-.
- Reflection and refraction of elastic waves. *Knott, C. G.* Ph. Mg. 48 (1899) 567-.
- — — — —. *Gray, T.* Ph. Mg. 48 (1899) 568-.
- — — — plane and longitudinal waves, theory. *Sluginov, N. P.* Kazan S. Ps.-Mth. Bll. 3 (1893) (Prot.) 20-.
- — — — transverse waves, theory. *Sluginov, N. P.* Kazan S. Ps.-Mth. Bll. 3 (1893) (Prot.) 24-.
- — — — waves at viscous media. *Drude, P.* A. Ps. C. 41 (1890) 759-.
- — — — waves in medium having periodic discontinuity of structure. *Lamb, H.* Manch. Lt. Ph. S. Mm. & P. 42 (1898) No. 3, 20 pp.
- Interference phenomenon on dunes, Haligoland. *Hallier, E.* Pogg. A. 114 (1861) 657-.
- of plane waves, apparatus to illustrate. *Woodward, C. J.* L. Ps. S. P. 2 (1879) 182-; Ph. Mg. 4 (1877) 184-.
- sound rays in air surrounding vibrating forks, etc. *Weber, W. E.* Schweigger J. 48 (=Jb. 18) (1826) 385-.
- 2 vibrating strings. *Puluj, J.* Wien Ak. Sb. 96 (1888) (Ab. 2) 947-.
- waves on surface of liquid, projection. *Lommel, E.* Erlang. Ps. Md. Š. Sb. 17 (1885) 36-.
- — — — — mercury. *Decharme, C.* (xii) M.-et-L. S. Ac. Mm. 32 (1875) 1-.

## 9050 Interference, Diffraction, and Scattering of Waves. Huygens's Principle.

- Aperture, circular, and ellipsoidal obstacles in path of waves. *Rayleigh, (Lord).* Ph. Mg. 44 (1897) 28-.
- Apertures in plane screens in path of waves, etc. *Rayleigh, (Lord).* Ph. Mg. 43 (1897) 259-.
- Diffraction phenomenon. *Franklin, W. S.* Ps. Rv. 2 (1895) 469-.
- Disturbance by an element of plane wave of sound or light. *Basset, A. B.* L. Mth. S. P. 22 (1891) 317-.
- — spherical obstacle. *Rayleigh, (Lord).* [1872] L. Mth. S. P. 4 (1871-73) 253-.

### HUYGENS'S PRINCIPLE.

- Vliet, P. P. van der.* Rs. Ps.-C. S. J. 18 (Ps.) (1896) 365.
- Potier, A.* C. R. 112 (1891) 220-.
- Volterra, V.* N. Cim. 31 (1892) 244-; 32 (1892) 59-; 33 (1893) 32-, 71-.

## VIBRATIONS.

### 9100 General.

(See also Mechanics 3220.)

- Neesen, F.* A. Ps. C. 30 (1887) 432-.
- (Neesen.) *Dvořák, V.* A. Ps. C. 31 (1887) 536-.
- (Dvořák.) *Neesen, F.* A. Ps. C. 32 (1887) 310-.
- Acoustic figure, liquid. *Pflaum, H.* Riga Cor.-Bl. 41 (1898) 115-.
- figures due to aerial vibrations, various methods. *Melde, F.* A. Ps. C. 139 (1870) 485-.
- Elasticity of heterophonous bodies (vibrating plates and rods). *Baudrimont, A.* A. C. 32 (1851) 288-.
- Emission of sound. *Gilbault, H.* C. R. 118 (1894) 135-, 1037-, 1244-.
- Experiments. *Fuchs, F.* A. Ps. C. 21 (1884) 513-.
- *Baur, C.* A. Ps. C. 23 (1884) 150-.
- Flames, impinging, tones. *Noack, K.* Giessen Oberh. Gs. B. 22 (1883) 194-.

9100 Musical Sand      Production of Sound      Vibrations 9100

Iron, clang of. *Blesson, L.* Hermbstädt Ms. 5 (1815) 286-.  
 Iso-periodic systems. *Rayleigh, (Lord).* Ph. Mg. 46 (1898) 567-.

MUSICAL SAND.

(Cabúl.) *Burnes, A.* Beng. As. S. J. 7 (1888) 324.  
 (Sinai.) *Palmer, H. S.* B. A. Rp. 41 (1871) (Sect.) 188-.  
 (Hawaii.) *Frink, W. R.* (ix) Calif. Ac. P. 5 (1873-74) 338-.  
 (Microscopic examination.) *Frink, W. R.* M. Mcr. J. 16 (1876) 96-.  
*Bolton, H. C., & Julien, A. A.* [1888] Am. As. P. 32 (1884) 251-; Science 2 (\*1888) 718.  
*Tarr, R. S.* Science 2 (\*1888) 764.  
*Bolton, H. C.* [1884] N. Y. Ac. T. 3 (1885) 72-, 97-, 98-.  
*Bolton, H. C., & Julien, A. A.* Am. As. P. (1884) 408-.  
 (Dorsetshire.) *Carus-Wilson, C.* Nt. 38 (1888) 415.  
*Bolton, H. C., & Julien, A. A.* Nt. 38 (1888) 515.  
*K.* Nt. 38 (1888) 515.  
*Hunt, A. R.* Nt. 38 (1888) 540.  
*Pidgeon, D.* Nt. 38 (1888) 590.  
 (True cause.) *Julien, A. A., & Bolton, H. C.* [1888] N. Y. Ac. T. 8 (1888-89) 9-.  
*Bolton, H. C.* N. Y. Ac. T. 8 (1888-89) 182-.  
 (Sinai.) *Bolton, H. C.* [1889] N. Y. Ac. T. 9 (1889-90) 21-, 123-.  
*Olliff, A. S.* Nt. 39 (1889) 224.  
 (Hawaii and California.) *Bolton, H. C.* [1890] N. Y. Ac. T. 10 (1890-91) 28-.  
*Carus-Wilson, C.* Nt. 42 (1890) 568.  
*Bolton, H. C.* Nt. 43 (1891) 30.  
*Carus-Wilson, C.* Nt. 46 (1892) 316.  
 (Hawaii.) *Woolman, L.* Am. Mcr. J. 18 (1897) 234-.

Musical stones (phonoliths from near Leipzig).  
*Sauer, G. A.* [1882] Leip. Nf. Gs. Sb. 9 (1883) 2-.  
 ——. *Mullen, B. H.* Dubl. S. Sc. P. 4 (1885) 432-.  
 ——. *Mancini, E.* N. Antol. Sc. 122 (1892) 533-.  
 Non-musical sand, production of musical notes from. *Carus-Wilson, C.* Nt. 44 (1891) 322-.

PRODUCTION OF SOUND.

*Blanc, —.* Schweigger J. 28 (1820) 88-.  
*Kane, (Sir) R. J.* [1840] Ir. Ac. P. 2 (1840-44) 13-.  
*Fermond, C.* C. R. 17 (1843) 800-; 18 (1844) 171-.  
 (Vibrations producing sound.) *Ward, W. S.* [1845] W. Yorks. P. Gl. S. 2 (1842-48) 230-.  
*Baudrimont, A.* C. R. 33 (1851) 428-.  
*Blaserna, P.* Palermo G. Sc. Nt. 2 (1866) 66-.  
 (Vibrations producing musical sounds.) *Purser, F.* [1869] Dubl. S. J. 5 (1870) 429-.

by blowing into mercury. *Decharme, C. J.* (xii) M.-et-L. S. Ac. Mm. 32 (1875) 1-.  
 — bullroarers of Australian aborigines. *Mathews, R. H.* Ap. I. J. 27 (1898) 52-.  
 — carbon (musical sounds). *Phipson, T. L.* C. N. 8 (1863) 163.  
 — collision. *Leconte, F.* Arch. Sc. Ps. Nt. 25 (1891) 295-.  
 — efflux of liquids. *Martini, T.* [1882-83] Ven. I. At. 8 (1881-82) 961-; (\*1883-84) 109-.  
 — — — water. *Sondhaus, C.* [1864] A. Ps. C. 124 (1865) 1-, 235-.  
 electrical methods, and telephonic transmission. *Kallmann, M.* Exner Rpm. 25 (1889) 426-.  
 by intermittent current, apparatus. *Yvon, P.* Par. S. Ps. Sé. (1878) 42-.  
 — — — magnetisation. *Delezenne, —.* Lille Mm. S. (1888) 49-.  
 — — —. *Matteucci, C.* Arch. de l'Électr. 5 (1845) 389-.  
 — — —. *Bachmetjev, P.* Bs. Ps.-C. S. J. 17 (Ps.) (1885) 65-; Fsch. Ps. (1885) (Ab. 2) 743-; Exner Rpm. 26 (1890) 187-.  
 on railways. *Oppel, J. J.* (xii) Frkf. a. M. Ps. Vr. Jbr. (1863-64) 66-.  
 by rotating bodies. *Cagniard-Latour, C.* Par. S. Phlm. PV. (1842) 58-.  
 — sillicic acid jelly. *Wagner, J. P.* (xi) D. Nf. Tbl. (1867) 35-.  
 sounding systems. *Warburg, E. A.* Ps. C. 136 (1869) 89-.  
 by tapping. *Chladni, E. F. F.* Pogg. A. 8 (1826) 453-.  
 theory. *Stern, S.* Wien Ak. Sb. 69 (1874) (Ab. 2) 15-.

Sonorous phenomenon on Etna (whistling sound in atmosphere). *Galvagni, G. A.* Catania At. Ac. Gioen. 12 (1837) 325-.  
 Sonorousness, cause. *Haldat du Lys, C. N. A.* Nancy Mm. S. Sc. (1848) 362-.  
 Theory of sound. *Chladni, E. F. F.* Berl. Gs. Nt. Fr. N. Schr. 1 (1795) 102-.  
 — — — (Chladni's work). *Prony, R. de.* J. de Ps. 68 (1809) 311-.  
 — — —. *Oppel, J. J.* Pogg. A. 94 (1855) 357-, 530-.  
 — — — and tone, Savart's experiments. *Weber, W. E.* Schweigger J. 44 (=Jb. 14) (1825) 885-; 45 (=Jb. 15) (1825) 257-; 51 (=Jb. 21) (1827) 291-.

VIBRATIONS.

of air. *Savart, F. A. C.* 24 (1823) 56-; 29 (1825) 404-.  
 — — —, nature. *Challis, J.* Ph. Mg. 33 (1848) 462-.  
 — — — periodically heated. *Margules, M.* Wien Ak. Sb. 99 (1891) (Ab. 2a) 204-.  
 communication, experiment. *Klementič, I. D.* Nf. Vh. (1899) (Th. 2, Hälfte 1) 57-.  
 — by liquids. *Savart, F. A. C.* 31 (1826) 288-.  
 — among solids. *Savart, F.* [1819] A. C. 14 (1820) 113-.  
 — — — (Savart). *Chladni, E. F. F.* Gilbert A. 68 (1821) 160-; A. C. 20 (1822) 74-.

- communication from vibrating body to a gas. *Stokes, G. G.* Phil. Trans. 158 (1868) 447-.
- — — — — *Brillouin, M.* A. C. 2 (1894) 417-.
- damping in perfectly elastic media. *Podlaski, L.* Prace Mt.-Fiz. 9 (1898) 46-.
- due to condensation of vapour. *Wanka, J.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 1105-.
- effect on suspended disc. *Rayleigh, (Lord).* Camb. Ph. S. P. 4 (1883) 18.
- elastic. *Müller, J. J.* Leip. B. 22 (1870) 1-.
- of elastic fluid. *Challis, J.* Ph. Mg. 33 (1848) 360-.
- electro-magnetic, of air, telephonic reproduction of sounds by. *Larroque, F.* Lum. Élect. 14 (1884) 259-.
- elliptical, in fluids. *Crémieu, V.* C. R. 125 (1897) 935-.
- of flame of Argand-burner. *Reusch, E.* A. Ps. C. 139 (1870) 493-.
- fluids or solids, Savart's law, demonstration. *Cauchy, A. L.* [1829] Par. Mm. Ac. Sc. 9 (1830) 117.
- frequency of vibration of system in its gravest mode, with example from hydrodynamics. *Rayleigh, (Lord).* Ph. Mg. 47 (1899) 566-.
- of gas within rigid spherical envelope. *Rayleigh, (Lord).* [1872] L. Mth. S. P. 4 (1871-73) 93-.
- heat accompanying certain. *Leroux, F. P. C.* R. 50 (1860) 656-, 729-.
- linear, theory. *Sang, E.* Edinb. N. Ph. J. 6 (1857) 259-; 7 (1858) 237-; 8 (1858) 41-, 193-; 9 (1859) 82-.
- at liquid surface. *Lechat, F. H.* C. R. 89 (1879) 299-; 90 (1880) 1545-; A. C. 19 (1880) 289-.
- — — in circular vessel, forms. *Decharme, C.* C. R. 92 (1881) 1500-; A. C. 25 (1882) 112-.
- — — — rectangular vessel. *Lechat, F. H.* Par. S. Ps. Sé. (1880) 83-.
- longitudinal. *Savart, F.* A. C. 65 (1887) 337-.
- *Burg, P. van der.* Pogg. A. 103 (1858) 620-.
- metal bridges, vibrations and fall. *Bellet, D.* Rv. Sc. 52 (1893) 272-.
- nature. *Mayer, A. M.* Nt. 18 (1878) 571-, 594-, 648-.
- normal. *Savart, F.* A. C. 36 (1827) 187-.
- phenomena explained by. *Landur, N.* Presse Sc. 1 (1863) 157-.
- of plates and other solids, air in organ pipes, etc. *Chladni, E. F. F.* J. de Ps. 68 (1809) 246-.
- produced by heat. *Resti-Farrari, G.* A. Sc. Lomb. Ven. 4 (1834) 147-.
- small, of gases, theory. *Challis, J.* [1829] Camb. Ph. S. T. 3 (1830) 269-.
- of solids. *Savart, F.* A. C. 25 (1824) 12-, 138-, 225-.
- — — *Navier, C. L. M. H.* Par. S. Phlm. Bll. (1825) 178-.
- — — *Röhra, J. H.* [1864] Camb. Ph. S. T. 11 (1871) 324-.
- — — *Guthrie, Fred.* Ph. Mg. 9 (1880) 15-.
- of solids (homogeneous and isotropic). *Tedone, O.* Tor. Ac. Sc. Mm. 47 (1897) 181-.
- — — effect of internal friction. *Hopkinson, J.* Mess. Mth. 5 (1871) 208-.
- — — — various media on frequency. *Savart, F.* A. C. 30 (1825) 264-.
- — — in fluids. *Kolděek, F.* Wien Ak. Sb. 87 (1883) (Ab. 2) 1147-.
- — — and liquids, forms. *Decharme, C. [J.]* C. R. 86 (1878) 453-; 87 (1878) 251-, 354-, 551; 88 (1879) 553-; (xii) M.-et-L. S. Ac. Mm. 36 (1881) 1-, 275-.
- sonorous, of air. *Wertheim, G.* C. R. 32 (1851) 14-; A. C. 31 (1851) 385-.
- of sonorous bodies. *Poisson, S. D.* A. C. 36 (1827) 86-.
- — — — damping by air. *Bourget, J.* C. R. 72 (1871) 560-.
- sonorous, of liquids. *Cagniard-Latour, C.* [1833-39] A. C. 56 (1834) 252-, 280-; Par. S. Phlm. PV. (1836) 46-; (1839) 95-.
- — — solids. *Cagniard-Latour, C.* Par. S. Phlm. PV. (1839) 113-.
- theory, simplification. *Cellérier, C.* Arch. Sc. Ps. Nt. 3 (1880) 549-.
- transverse, in liquids. *Dubois, P.* C. R. 86 (1878) 295-.
- , of sounding liquids and gases. *Matthiessen, L.* A. Ps. C. 141 (1870) 375-.
- in water drops. *Strehlke, F.* Pogg. A. 40 (1837) 146-.
- of water in tubes. *Dvořák, V.* Wien Ak. Sb. 71 (1875) (Ab. 2) 315-.
- Water-pipes, singing. *Croft, W. B.* [1894] Nt. 51 (1894-95) 107.
- Waves of finite amplitude, plane and spherical. *Burton, C. V.* L. Ps. S. P. 12 (1894) 161-; Ph. Mg. 35 (1893) 317-.
- , stationary (theory). *Bezold, W. von.* Münch. Ak. Sb. 7 (1877) 188-.
- , —, Bernoulli effect. *Davis, B.* [1900] N. Y. Ac. A. 13 (1900-01) 487-; Am. J. Sc. 10 (1900) 231-.
- , —, wire-helix models. *Bongiovanni, G.* Rv. Sc. [Ind.] 30 (1898) 123-.

### 9105 Mechanical Action of Vibrations (Acoustic Attraction).

*Boehm, E. E., & Schellbach, K. H.* A. Ps. C. 7 (1879) 1-.

#### ACOUSTIC ATTRACTION.

- Guthrie, Fred.* [1869] R. S. P. 18 (1870) 93-; 19 (1871) 35-.
- Thomson, (Sir) W.* Ph. Mg. 41 (1871) 423-.
- caused by velocity, and resulting in vibration. *Smith, Herm.* Nt. 8 (1873) 26-.
- and repulsion. *Guyot, J.* [1834-61] L'I. 2 (\*1834) 93; (vii) Cosmos 7 (1870) 145-.
- — — *Schellbach, C. H.* A. Ps. C. 139 (1870) 670-; 140 (1870) 325-, 495-.

- and repulsion. *Moutier, J.* Par. S. Phlm. Bil. 11 (1874) 32-.
- —. *Dvořák, V.* [1875] Wien Ak. Sb. 72 (1876) (Ab. 2) 213-.
- —. *Martini, T.* (xii) Rv. Sc.-Ind. 11 (1879) 306-.
- —. *Provenzali, F. S.* [1882] Rm. N. Linc. At. 36 (1883) 9-.
- — of bodies vibrating in fluid media. *Berson, G.* Toul. Ac. Sc. Mm. 5 (1893) 406-.
- —, and magnetic analogies. *Stroh, A.* Tel. E. J. 11 (1882) 192-, 293-.
- 
- Acoustic repulsion. *Dvořák, V.* A. Ps. C. 3 (1878) 328-.
- — (Dvořák). *Mayer, A. M.* Am. J. Sc. 16 (1878) 27-.
- —. *Rayleigh, (Lord).* Ph. Mg. 6 (1878) 270-.
- Explosives, effect. *Tait, —.* Edinb. R. S. P. 14 (1888) 110-.
- Hydrodynamic-acoustic researches. *König, W.* A. Ps. C. 42 (1891) 353-, 549-; 43 (1891) 43-; 50 (1893) 639-.
- Instrument for measuring intensity of aerial vibrations. *Rayleigh, (Lord).* Ph. Mg. 14 (1882) 186-.
- Longitudinal aerial vibrations excited by transversal. *Stefan, J.* Wien Sb. 61 (1870) (Ab. 2) 491-.
- Quartz fibres. *Boys, C. V.* Nt. 42 (1890) 604-.
- Rotation, acoustic, continuous. *Haberditzl, A.* Wien Ak. Sb. 77 (1878) (Ab. 2) 641-.
- due to vibration. *Savart, F. A. C.* 36 (1827) 257-.
- — —. *Cagniard-Latour, C.* Par. S. Phlm. PV. (1839) 87-.
- Sound radiometer and sound waves. *Dvořák, V.* [1881] Wien Ak. Sb. 84 (1882) (Ab. 2) 702-.
- Vibration and theory of action at a distance. *Eötvoš, (báró) L.* (xii) Mag. Tud. Ak. Éts. 5 (No. 12) (1871) 207-.
- after-strain effects. *Šebuev, G. N.* Kazan S. Nt. (Ps.-Mth.) P. 7 (1899) 374-.
- apparatus for production of stationary waves in. *Lehnebach, A.* A. Ps. C. 23 (1884) 157-.
- for studying. *Schwedoff, T.* Par. S. Ps. Sé. (1878) 144.
- beats in. *Maltézos, C.* C. R. 129 (1899) 438-.
- bowed. *Mach, E.* A. Ps. C. 134 (1868) 311-.
- —. *Neumann, Clem.* Wien Sb. 61 (1870) (Ab. 2) 89-.
- , harmonics. *Melde, F.* Pogg. A. 114 (1861) 609-.
- , theory. *Voigt, W.* Gött. Nr. (1890) 502-.
- carrying cursors. *Duhamel, J. M. C.* C. R. 11 (1840) 15-, 810-; Par. Éc. Pol. J. 29<sup>e</sup> cah. (1843) 1-.
- circular vibrations. *Neyreneuf, —.* As. Fr. C. R. (1895) (Pt. 2) 377-; Caen Ac. Mm. (1896) (Pt. 1) 26-.
- compound harmonic vibrations. *Hallock, —.* [1899] N. Y. Ac. A. 12 (1899-1900) 665-.
- elastic, with one end vibrating, motion. *Mercadier, E.* C. R. 77 (1873) 639-, 671-, 1292-, 1366-.
- — — — — (Mercadier). *Valérius, H.* C. R. 77 (1873) 1184-.
- , hung at one end and cut, wave-motion in. *Niven, C.* [1878] Mess. Mth. 8 (1879) 75-.
- energy. *Grinwis, C. H. C.* As. Fr. C. R. 6 (1877) 317-.
- equation, construction: *Monge, G.* Par. Éc. Pol. J. 8 (1809) 118-.
- experiment. *Mach, E.* [1888] Humb. 9 (1890) 347.
- experiments. *Tyndall, J. R. I. P.* 4 (1866) 685-.
- — — — —. *Melde, F.* A. Ps. C. 21 (1884) 452-; 24 (1885) 497-; 30 (1887) 161-.
- (Melde). *Elsas, A.* A. Ps. C. 25 (1885) 676-.
- flexible and inextensible, integration of differential equations. *Maggi, G. A.* Mil. I. Lomb. Rd. 19 (1886) 682-.
- , motion. *M.* QJ. Mth. 4 (1861) 178-.
- formula for. *Delesenne, —.* Lille Mm. S. (1850) 12-.
- harmonics. *Zantedeschi, F.* Wien SB. 27 (1857) 271-.
- heterogeneous. *Bourget, J.* C. R. 63 (1866) 328-; Par. Éc. Norm. A. 4 (1867) 37-; (ix) Par. Obs. A. 9 (1868) 151-.
- — — — —. *Stefan, J.* Wien Sb. 57 (1868) (Ab. 2) 517-.
- india-rubber, longitudinal vibrations. *Lang, V. von.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 692-.
- , transverse vibrations. *Lang, V. von.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 1041-.
- — — — —, frequency. *Baker, T. J.* L. Ps. S. P. 17 (1901) 107-; Ph. Mg. 49 (1900) 347-.
- influence of elasticity. *Savart, N.* A. C. 6 (1842) 5-; C. R. 14 (1842) 915-.
- — — — — (Savart). *Duhamel, J. M. C.* C. R. 14 (1842) 953-.
- law of tensions. *Williams, H. G.* Nt. 44 (1891) 591-.
- — — — — vibrations, method of demonstrating. *Bazzi, E.* N. Cim. 22 (1887) 155-.

## 9110 Vibrations of Strings and Rods. Curved Rods.

### STRINGS.

- Young, (Dr.) T.* Phil. Trans. (1800) 106-.
- Thomson, W.* (vi Adds.) Camb. Mth. J. 3 (1843) 257-.
- Seebeck, A.* Leip. Ab. Jablon. Gs. (1846) 129-.
- Behrens, T. H.* [1873] (xii) Schl.-Holst. Nt. Vr. Schr. 1 (1875) 153.
- Krigar-Menzel, O., & Raps, A.* Berl. Ak. Sb. (1891) 613-.
- Æolian harp. *Strouhal, V.* Würzb. Ps. Md. Vh. 12 (1878) 199-.
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*Hofmann, (Dr.) —.* Dresden Sb. Isis (1871) 108-.

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*Mayer, A. M.* Ph. Mg. 48 (1874) 266-, 371-, 445-, 513-; Am. J. Sc. 8 (1874) 241-; 9 (1875) 267-; 12 (1876) 329-; 47 (1894) 1-, 134.

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tuning fork. *Edison, T. A.* Am. J. Sc. 18 (1879) 395-.

unsymmetrical divergence of sound in air. *Bosanquet, R. H. M.* Ph. Mg. 4 (1877) 125-.

vibrations of air in open pipes. *Helmholtz, H.* Heidel. Vh. Nt. Md. (1857-59) 202-; Crelle J. 57 (1860) 1-.

— — — pipes of various forms, and tones from heated tubes. *Sondhauss, C.* A. Ps. C. 140 (1870) 53-, 219-.

### COMBINATION-TONES.

(Coalescence of musical sounds.) *Young, (Dr.) T.* Phil. Trans. (1800) 130-.

(Theory of compound sounds.) (Young.) *Gough, J.* Manch. Ph. S. Mm. 5 (1802) 653-.

(— — —) (Gough.) *Young, (Dr.) T.* Nicholson J. 2 (1802) 264-.

## 9140 Combination-Tones

- (Theory of compound sounds.) (Young.) *Gough, J. Nicholson J.* 3 (1802) 39-.
- (Phenomena of sound.) (Gough.) *Young, (Dr.) T. Nicholson J.* 3 (1802) 145-.
- (Grave harmonics.) (Young.) *Gough, J. Nicholson J.* 4 (1803) 1-.
- (— — —) (Gough.) *Young, (Dr.) T. Nicholson J.* 4 (1803) 72-.
- (Nature of musical sounds.) (Young.) *Gough, J. Nicholson J.* 4 (1803) 139-.
- (Young versus Gough.) *Vieth, G. U. A. Gilbert A.* 21 (1805) 265-.
- Hällström, G. G. Pogg. A.* 24 (1832) 438-.
- Ohm, G. S. Pogg. A.* 47 (1839) 463-.
- Willigen, V. S. M. van der. Amst. Vs. Ak.* 3 (1855) 115-.
- Helmholtz, H. Pogg. A.* 99 (1856) 497-.
- (Theory.) *Zantedeschi, F. Wien SB.* 25 (1857) 145-.
- Fabri, R. [1859] Rm. At.* 13 (1859-60) 61-.
- Radau, R. Les Mondes* 11 (1866) 529-.
- König, R. A. Ps. C.* 157 (1876) 177-.
- Bauer, K. L. A. Ps. C.* 4 (1878) 516-.
- Preyer, W. T. Jena. Sb.* (1878) lxxiv-.
- Amiel, A. [1879] (xii) Béziers S. Sc. Bll.* 4 (1890) 200-.
- Nicotra, L. J. de Ps.* 10 (1881) 33-.
- (Theory.) *Delsaulx, (le père) J. [1883] (xii) Brux. S. Sc. A.* 8 (1884) (Pt. 1) 52-, (Pt. 2) 25-.
- Helmholtz, H. von. Berl. Ps. Gs. Vh.* (1886) 69-.
- Preyer, W. Berl. Ps. Gs. Vh.* (1889) 15-.
- Voigt, W. Gött. Nr.* (1890) 159-.
- (Theory.) *Hermann, L. Pflüg. Arch. Pl.* 49 (1891) 499-.
- Melde, F. Pflüg. Arch. Pl.* 60 (1895) 623-.
- Everett, J. D. L. Pa. S. P.* 14 (1896) 93-; Ph. Mg. 41 (1896) 199-.
- Meyer, M. Z. Psychol.* 11 (1896) 177-.
- Meinong, A., & Witasek, S. Z. Psychol.* 15 (1897) 189-.
- Meyer, M. Z. Psychol.* 20 (1899) 13-.
- Apparatus. *Stumpf, C. Z. Psychol.* 6 (1894) 33-.
- Beat tones, production from 2 vibrating bodies of high frequency which are separately inaudible. *Mayer, A. M. B. A. Rp.* (1894) 573.
- Beats of consonances of form  $h:1$ . *Bosanquet, R. H. M. L. Ps. S. P.* 4 (1881) 221-; Ph. Mg. 11 (1881) 420-, 492-.
- imperfect harmonies. *Thomson, (Sir) W. Edinb. R. S. P.* 9 (1878) 602-.
- , variation of pitch in. *Taylor, S. Ph. Mg.* 44 (1872) 56-.
- Difference tones. *Meyer, M. Z. Psychol.* 16 (1898) 1-.
- (Meyer). *Ebbinghaus, H. Z. Psychol.* 16 (1898) 152-.
- (Ebbinghaus). *Meyer, M. Z. Psychol.* 16 (1898) 196-.
- Fusion of tones. *Faist, A. Z. Psychol.* 15 (1897) 102-.
- — —. *Stumpf, C. Z. Psychol.* 15 (1897) 280-, 354.
- — —. *Lipps, T. Z. Psychol.* 19 (1899) 1-.

## Propagation of Sound, General 9200

- Fusion of tones and consonance. *Meyer, M. Z. Psychol.* 17 (1898) 401-; 18 (1898) 274-.
- — — — (Meyer). *Stumpf, C. Z. Psychol.* 18 (1898) 294-.
- — — with the unmusical. *Stumpf, C. Z. Psychol.* 17 (1898) 422-.
- Intensity of components. *Meyer, M. Z. Psychol.* 17 (1898) 1-.
- Intermittent tones, physical conditions. *Zwaardemaker, H. Arch. An. Pl. (Pl. Ab.)* (1900) (Suppl.) 60-.
- Interrupted tones, blending, apparatus showing. *Mayer, A. M. Am. J. Sc.* 47 (1894) 283-.
- Kirchhoff's principle, model to illustrate. *Hallock, W. [1899] N. Y. Ac. A.* 12 (1899-1900) 620.
- Objective demonstration. *Burton, C. V. L. Ps. S. P.* 13 (1895) 436-; Ph. Mg. 39 (1895) 452-.
- existence of tones. *Rücker, A. W. B. A. Rp.* (1895) 626-.
- — — —. *Rücker, A. W., & Edser, E. L. Ps. S. P.* 13 (1895) 412-; Ph. Mg. 39 (1895) 341-.
- — — —, photographic evidence. *Forsyth, R. W., & Sowter, R. J. R. S. P.* 63 (1896) 396-.
- Obliteration of sensation of one sound by simultaneous action on ear of another more intense and lower sound. *Mayer, A. M. Am. J. Sc.* 12 (1876) 329-.
- Origin and perception. *Dennert, H. [1886] Arch. Ohrh.* 24 (1887) 171-.
- Perception of tones, with special reference to phase-differences. *Hermann, L. Pflüg. Arch. Pl.* 56 (1894) 467-.
- Siren and organ-pipe. *Barus, C. Am. J. Sc.* 5 (1898) 88-.
- Solution of problem by law of interference. *Poggendorff, J. C. Pogg. A.* 32 (1834) 520-.
- Subjective combination-tones in light of resonance theory of hearing. *Schaefer, K. L. Pflüg. Arch. Pl.* 78 (1899) 505-.
- — — — — — — — — — (Schaefer). *Meyer, M. Pflüg. Arch. Pl.* 81 (1900) 49-.
- — — — — — — — — — (Meyer). *Schaefer, K. L. [1900] Pflüg. Arch. Pl.* 83 (1901) 73-.
- Summation and combination-tones. *Appunn, A. A. Ps. C.* 42 (1891) 338-.
- Timbre. *König, R. A. Ps. C.* 14 (1881) 369-.
- Variation tones. *Dvořák, V. Wien Ak. Sb.* 70 (1874) (Ab. 2) 645-.
- — (Dvořák). *Haberditzl, A. Wien Ak. Sb.* 77 (1878) (Ab. 2) 204-.

## PROPAGATION OF SOUND.

### 9200 General.

- Biot, J. B. Par. S. Phlm. Bll.* 3 (1802) 116-.
- Gilbert, L. W. Gilbert A.* 21 (1805) 437-.
- Hassenfratz, J. H. A. C.* 53 (1805) 64-.
- Haldat du Lys, C. N. A. de. Nancy Tr. S. Sc.* (1813-15) 15-.
- Fröhlich, C. W. Gilbert A.* 58 (1818) 401-.

## 9200 Propagation of Sound

- Armi, G. dall'.* G. Arcad. 12 (1821) 164-, 321-; 13 (1822) 48-, 221-.
- Laurent, P. A.* C. R. 22 (1846) 80-.
- Strantz, F. von.* Bresl. Schl. Gs. Übs. (1852) 24-.
- Grinwis, C. H. C.* [1874] Amst. Ak. Vs. M. 9 (1876) 75-; Arch. Néerl. 10 (1875) 151-.
- Rayleigh, (Lord).* Ph. Mg. 3 (1877) 456-; 7 (1879) 149-; 9 (1880) 278-; 13 (1882) 340-.
- Rink, H. J.* Arch. Néerl. 12 (1877) 262-.
- Decharme, C.* C. R. 88 (1879) 1082-.
- Waals, J. D. van der.* [1879] (xii) Amst. Ak. Wet. P. (1879-80) No. 6, 8-; (xi) A. Ps. C. Beibl. 4 (1880) 531-.
- Allard, É.* C. R. 95 (1882) 1062-.
- Acoustic reversibility. *Tyndall, J.* R. S. P. 23 (1875) 159-.
- Action of accelerating force. *Alencar Silva, O. d'.* G. Teix. J. Sc. 14 (1900) 17-, 97-.
- Agency of sound. *Shand, —.* B. A. Rp. (1840) (pt. 2) 52-; Sturgeon A. Electr. 6 (1841) 245-.
- Anomalous propagation. *Gouy, —.* C. R. 111 (1890) 910-.
- *Ventosa, V.* [1898] Ciel et Terre 19 (1898-99) 1-.
- Apparatus to show non-propagation of sound in vacuum (bell-machine). *Castell, H.* [1838] Sturgeon A. Electr. 3 (1838-39) 66-.
- *Gellio, G.* Rv. Sc.-Ind. [24 (1892)] 106-.
- Barometer, effect of sound on. *Englefield, H. C. R. I. J. 1* (1802) 157-.
- *Benzenberg, J. F.* Gilbert A. 39 (1811) 129-.
- Bell, electromagnetic, application to experiments. *Wilson, G.* [1846] Edinb. T. Sc. S. Arts 3 (1851) 120-.
- Bells, sounds in different gases (Chladni's experiments on sounds of organ-pipe in different gases). [*Perrolle non*] *Perrolle, É.* Tilloch Ph. Mg. 4 (1799) 283-.
- Density of atmosphere, effect of small variation on amplitude of sound-waves. *Holmes, R.* Manch. Lt. Ph. S. Mm. & P. 1 (1888) 18-.
- *Holmes, R.* Manch. Lt. Ph. S. Mm. & P. 2 (1889) 221-.
- Direction of sound, experiments in judging. *Ikenberry, L. D., & Shutt, C. E.* [1897] Kan. Un. Q. 7 (1898) 9-.
- *Johnson, A. B.* Smiths. Misc. Col. 33 (1888) Art. 3, 12- (Wash. Ph. S. Bll. 8 (1885).)
- Discontinuities in propagation of explosive phenomena. *Vieille, P.* C. R. 129 (1899) 1228-; 131 (1900) 413-.
- *Vieille, —.* Par. S. Ps. Sé. (1900) 61-.
- Distance of sound, experiments in judging. *Shutt, C. E.* [1897] Kan. Un. Q. 7 (1898) 1-.
- travelled rectilinearly by sound. *Leroux, F. P. A. C.* 12 (1867) 406-.
- Distant cannonade. *Sinclair, W. F.* Nt. 58 (1897) 223-.
- *Mostyn, C.* Nt. 56 (1897) 248-.

## Molecular Theory 9200

- Distant cannonade. *Davison, C.* Nt. 62 (1900) 377-.
- *Mallet, J. W.* Nt. 62 (1900) 523-.
- explosions, feeling and hearing. *Davison, C.* [1899] Nt. 61 (1899-1900) 91-.
- Ear trumpet for use in war. *Prätorius, C. F. A.* Gilbert A. 39 (1811) 150-.
- trumpets and stethoscopes, efficiency. *Geigel, R.* Viroh. Arch. 140 (1895) 165-, 535-.
- *Gough, J.* Nicholson J. 18 (1807) 310-.
- Equations, general, of small motions of molecules of gases, application. *Duhamel, J. M. C.* C. R. 55 (1862) 223-.
- , integration. *Parseval, M. A.* [1801] Par. Mm. Sav. Étr. 1 (1806) 379-.
- *Liouville, J. C. R.* 7 (1838) 247-.
- *Moon, R.* Ph. Mg. 46 (1873) 122-.
- Experiments. *Perrolle, É.* Turin Mm. Ac. (1790-91) 195-.
- (*Perrolle*). *Nicholson, W.* Nicholson J. 1 (1797) 416-.
- during siege of Paris. *Lucas, F.* C. R. 75 (1872) 204-.
- Explosions. *Sebert, (le col.) —.* Par. S. Ps. Sé. (1888) 35-.
- *Wolff, W.* A. Ps. C. 69 (1899) 329-.
- Influence of light. *Paroletti, M.* [1805] Turin Mm. Ac. (1805-08) 141-.
- unequal temperature distribution. *Gromeka, I. S.* Rec. Mth. (Moscou) 14 (1890) 283-; Fsch. Ps. (1889) (Ab. 1) 563-.
- "The invisible lady." *Pfaff, C. H.* Gilbert A. 28 (1808) 244-.
- *Schmidt, — (Apoth. in Sonderburg).* Gilbert A. 29 (1808) 470-.

### KINETIC THEORY.

- (Physics of media composed of free and perfectly elastic molecules.) (With introduction by Lord Rayleigh.) *Waterston, J. J.* [1846] Phil. Trans. (A) 183 (\*1893) 1-.
- Hoorweg, J. L.* Arch. Néerl. 11 (1876) 131-.
- Preston, S. T.* Ph. Mg. 3 (1877) 441-; 4 (1877) 77; Nt. 18 (1878) 253-.
- Lorentz, H. A.* Amst. Ak. Vs. M. 15 (1880) 350-; Arch. Néerl. 16 (1881) 1-.
- Mees, R. A.* Amst. Ak. Vs. M. 15 (1880) 394-; A. Ps. C. Beibl. 5 (1881) 244-.
- Watson, (Rev.) H. W.* [1884] Birm. Ph. S. P. 4 (1883-85) 242-.
- Hirn, G. A.* Brux. Ac. Bll. 11 (1886) 131 (*bis*)-.
- Kruseman, J. Nieuwenhuijzen.* Haarl. Ms. Teyl. Arch. 5 (1898) 207-.
- Meteorite, falling, phenomenon. *Mach, E., & Doss, B.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 248-.
- Motions of atmosphere. *Helmholtz, — von.* D. Nt. Tbl. (1889) 199.
- Petroleum wells, sound propagation at bottom. *Ishiwara, —.* Tök. Gl. S. J. 5 (1898) [265]-. [*Jap.*]
- Phenomenon of Monte Tomaticco, near Feltre. *Haidinger, W.* Wien Gl. Jb. 4 (1853) 559-.

- Pitch of sound, alteration by conduction through different media. *Ringer, S. R. S. P.* 10 (1859-60) 276-.
- Potential with 4 variables, application to theory of sound; proof of Poisson's formula. *Bousinesq, J. C. R.* 94 (1882) 1465-.
- Pressures of air during propagation. *Clausius, R. C. R.* 55 (1862) 367-.
- Production and propagation. *Williams, C. J. B. Ph. Mg.* 6 (1885) 25-.
- — —. *Mackenzie, (Sir) G. S. Edinb. N. Ph. J.* 42 (1847) 197-.
- of sound of great intensity. *Tait, P. G. Edinb. R. S. P.* 9 (1878) 737-.
- Projectiles, rapid. *Durand-Gréville, E. Rv. Sc.* 41 (1888) 494-.
- , —, phenomenon. *Réveille, (le lt.) V. Rv. Mar. et Col.* 123 (1894) 241-; 126 (1895) 243-.
- Propagation in long pipes. *Biot, J. B. Par. S. Phlm. Bll.* 1 (1808) 269-.
- pipes. *Neyreneuf, V. C. R.* 95 (1882) 218-.
- — —. *Violle, —, & Vautier, —. C. R.* 102 (1886) 103-; 110 (1890) 230-; A. C. 19 (1890) 306-.
- — —. *Neyreneuf, V. C. R.* 111 (1890) 28-; A. C. 22 (1891) 368-.
- — —. *Violle, J., & Vautier, T. C. R.* 120 (1895) 1402-; 121 (1895) 51-.
- — — to great distance. *Schale, —. Z. Berg. H.-Salw.* 45 (1897) (Ab.) 271-.
- Liquids. *Ellis, F. Nicholson J.* 25 (1810) 188-.
- Moving air. *Jüger, G. Wien Ak. Sb.* 105 (1896) (Ab. 2a) 1040-.
- Solids. *Chladni, E. F. F. Voigt Mg.* 1 (1797) 7-.
- — —. *La Place, P. S. (marquis) de. Par. S. Phlm. Bll.* (1816) 190-.
- — —. *Gezechus [Hesehus], N. A. Ra. Ps.-C. S. J.* 26 (Ps.) (1894) 322-; J. de Ps. 4 (1895) 586-.
- and liquids. *Arnim, L. A. von. Gilbert A.* 4 (1800) 112-.
- Water. *Nollet, —. Gilbert A.* 44 (1813) 346-.
- — —. *Muncke, G. W. Gilbert A.* 48 (1814) 66-.
- — —. *Colladon, D. C. R.* 13 (1841) 439-.
- , sound shadows in. *Le Conte, (Prof.) J. [1881] Am. J. Sc.* 23 (1882) 27-.
- Wires, etc., transmission of musical sounds by. *Wheatstone, (Sir) C. R. I. J.* 2 (1831) 223-.
- , transmission by; and simple microphone receivers. *Millar, W. J. [1879] Glasg. Ph. S. P.* 12 (1880) 20-.
- , — of speech by. *Weinhold, A. Carl Bpm.* 6 (1870) 168-.
- , — — —, etc. by. *Millar, W. J. L. Ps. S. P.* 2 (1879) 292-; Ph. Mg. 6 (1878) 115-.
- Wood. *Walker, Ez. Nicholson J.* 4 (1803) 69-.
- Reciprocity, principle of, applied to acoustics. *Rayleigh, (Lord). [1876] R. S. P.* 25 (1877) 118-.
- Rectilinear diffusion of sound. *Kalischer, S. Berl. Ps. Gs. Vh.* (1890) 111-.
- transmission of sound and light. *Challis, J. Ph. Mg.* 11 (1881) 249-.
- Signals, anomalies. *Welling, J. C. [1881] Wash. Ph. S. Bll.* 5 (1883) 39-.
- and audibility. *Allard, É. A. Pon. Chauss.* 5 (1883) 567-.
- , cannon-. *Delauney, —. Rv. Mar. et Col.* 81 (1884) 229-.
- , Lecoine's system. *Guarienti, A. [1899] Rv. Mar. et Col.* 146 (1900) 604-.
- , marine danger-. *Brodie, J. [1866] Edinb. Sc. S. Arts P.* 7 (1868) 102-.
- , —, use of siren and resonators as. *Genglaire, —. Rv. Mar. et Col.* 94 (1887) 346-.
- , submarine. *Brillouin, —. C. R.* 104 (1887) 1821-.
- , —. *Hardy, E. C. R.* 126 (1898) 1496-.
- , — (acoustic triangulation). *Baxter, S. Nt.* 62 (1900) 422-.
- Siren fog-horn, electric, Trudeau's. *Keeley, D. H. Sc. Abs.* 2 (1899) 638.
- Soundless zones, Duane's. *Tyndall, J. [1882] R. S. P.* 34 (1883) 18-.
- Speaking trumpets. *Hassenfratz, J. H. [1804] Par. Mm. Sav. Étr.* 2 (1811) 101-.
- — and bells of wind instruments. *Neyreneuf, —. Caen Ac. Mm.* (1891) (Pt. 1) 3-.
- — — ear trumpets, theory. *Daguin, P. A. Toul. Mm. Ac.* 2 (1864) 410-.
- — —, mathematical theory. *Gough, J. Nicholson J.* 10 (1805) 160-.

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- The Earth. *Jannettaz, É. Par. S. Gl. Bll.* 1 (1873) 117-.
- — —. *Forel, F. A. Nt.* 31 (1885) 483-.
- Elastic media. *Blake, E. W. Silliman J.* 5 (1848) 373-.
- Gases. *Chladni, E. F. F. J. de Ps.* 69 (1809) 138-.
- — —. *Kerby, F., & Merrick, A. Nicholson J.* 27 (1810) 269-; 33 (1812) 161-.
- — —. *Terquem, A. [1873] A. Ps. C.* 151 (1874) 620-.
- — —. *Dvořák, V. Wien Ak. Sb.* 69 (1874) (Ab. 2) 151-.
- — —. *Neyreneuf, V. C. R.* 96 (1883) 1312-; A. C. 2 (1894) 251-.
- , integral of fundamental equation for propagation in. *Poisson, S. D. [1807-19] Par. Éc. Pol. J.* 14<sup>e</sup> cah. (1808) 319-; Par. Mm. Ac. Sc. 3 (1818) 121-.
- , — — — — — (Poisson). *Liouville, J. C. R.* 42 (1856) 465-.
- , mixed. *Brillouin, M. A. C.* 18 (1899) 433-.
- , propagation of condensation impulses in. *Curry, C. E. A. Ps. C.* 51 (1894) 460-.
- Heterogeneous medium. *Bertrand, J. C. R.* 22 (1846) 1136-.
- of lamellar structure. *Kasterin, N. Arch. Néerl.* 5 (1900) 506-.
- Homogeneous unlimited medium in equilibrium. *Dieu, T. Liouv. J. Mth.* 14 (1849) 345-.

- Speaking trumpets, theory. *Riboldi, A.* Mil. At. S. It. 14 (1871) 82-.
- tube. *Jobard, —.* Fr. Cg. Sc. (1835) 60-.
- Telephone "buzz" and weather conditions. *Struck, —.* Wetter 8 (1891) 96.
- and telegraph wires as weather prophets. *Eydam, —.* Wetter 17 (1900) 19-.
- Theory. *Biot, J. B.* J. de Ps. 55 (1802) 173-.
- *Fischer, E. G.* Berl. Ab. (1824) 75-.
- *Cooper, P. R. S. P.* 3 (1835) 342.
- *Popov, A. T.* (xii) Kazan Un. Mm. (1848) (Bk. 4) 15-; (iv) Liouv. J. Mth. 15 (1850) 78-.
- *Stokes, G. G.* Ph. Mg. 34 (1849) 52-.
- *Moon, R.* Ph. Mg. 37 (1869) 189-.
- *Roiti, A.* Rm. R. Ac. Linc. Mm. 1 (1877) 762-.
- *Newton's, Laplace's, etc.* *Winter, R.* Tilloch Ph. Mg. 43 (1814) 201-.
- — and modern. *Plana, G.* [1857] Tor. Mm. Ac. 18 (1859) 319-.
- of sound, and motion of fluids. *Trembley, J.* Berl. Mm. Ac. (1801) 33-.
- Tuning fork, application. *Montigny, C.* Brux. Ac. Bil. 50 (1880) 300-.
- —, intensity in different directions. *Chladni, E. F. F.* Kastner Arch. Ntl. 7 (1826) 92-.
- — — — —. *Chladni, E. F. F., & Sömmerring, W.* Kastner Arch. Ntl. 8 (1826) 91-.
- Wave boundary. *Blanchet, P. H.* [1841] C. R. 13 (1841) 339-; Liouv. J. Mth. 7 (1842) 13-.
- in compressible fluid under gravity. *Holmes, R.* Mess. Mth. 18 (1889) 108-.
- propagation, theorem. *Stoney, G. J.* Ph. Mg. 43 (1897) 273-.
- surfaces, forms, and the topophone. *Mayer, A. M.* Am. J. Ot. 1 (1879) 282-.
- theory of gases. *Bäcklund, A. V.* Stockh. Öfv. (1886) 3-, 327-; (1887) 115-, 351-, 549-; (1888) 103-, 305-; Mth. A. 34 (1889) 371-.
- Waves (nature). *Russell, J. S. B. A. Rp.* (1844) (pt. 2) 11.
- *Laurent, P. A.* C. R. 22 (1846) 251-.
- , cylindrical. *Grinwis, C. H. C.* [1875] Amst. Ak. Vs. M. 9 (1876) 229-; Arch. Néerl. 11 (1876) 458-.
- — and spherical. *Tumlirz, O.* [1880] Wien Ak. Sb. 82 (1881) (Ab. 2) 779-.
- , deformation. *Vicille, P.* C. R. 128 (1899) 1437-.
- of finite longitudinal disturbance, thermodynamic theory. *Rankine, W. J. M.* [1869] Phil. Trans. 160 (1870) 277-.
- , successive. *Blanchet, P. H.* Liouv. J. Mth. 9 (1844) 73-.
- Farey, J.* Tilloch Ph. Mg. 64 (1824) 178-.
- Ivory, J.* Tilloch Ph. Mg. 66 (1825) 3-.
- Galbraith, W.* Tilloch Ph. Mg. 66 (1825) 109-; 68 (1826) 214-; Ph. Mg. 4 (1828) 179-.
- (Ivory.) *Meikle, H.* QJ. Sc. (1828) (Pt. 2) 124-.
- Moll, G.* Edinb. N. Ph. J. 5 (1828) 154-.
- (Meikle.) *Ivory, J.* Ph. Mg. 5 (1829) 104-.
- Meikle, H.* Edinb. N. Ph. J. 6 (1829) 26-.
- Riccati, G.* G. Arcad. 48 (1830) 16-.
- Miller, W. H.* Ph. Mg. 15 (1839) 1.
- Sadebeck, M.* Bresl. Schl. Gs. Übs. (1844) 171-.
- Mossotti, O. F.* (vi Add.) Il Cim. 4 (1846) 97-.
- Bravais, A.* A. C. 34 (1852) 82-.
- Barré de Saint-Venant, —.* L'I. 24 (1856) 212-.
- Duhamel, J. M. C.* C. R. 55 (1862) 6-.
- (Duhamel's formula.) *Clausius, R.* C. R. 55 (1862) 204-.
- Kolk, H. W. Schroeder van der.* A. Ps. C. 124 (1865) 453-; Ph. Mg. 30 (1865) 391-.
- Kurz, A.* Z. Mth. Ps. 14 (1869) 440-.
- (Historical review.) *Cherbuliez, —.* Bern Mt. (1870) 141-; (1871) 1-.
- Luca, G. de.* (xii) Rv. Sc.-Ind. 9 (1877) 186-.
- (Work of Kraevič.) *Avenarius, M. P.* [1886] Kiev S. Nt. Mm. 8 (2) (1887) v-.
- Violle, J., & Vautier, T.* C. R. 106 (1888) 1003-.
- Goodenow, (Rev.) S.* Sid. Mess. 8 (1889) 307-, 392-.
- Sluginov, N. P.* Kazan S. Nt. (Ps.-Mth.) P. 7 (1889) 360-.
- Gezechus [Hesehus], N.* Rs. Ps.-C. S. J. 27 (Ps.) (1895) 269-; Fsch. Ps. (1896) (Ab. 1) 465-.
- Violle, J.* C. R. 127 (1898) 904-.
- Leduc, A.* C. R. 127 (1898) 1201-.
- Analytical considerations. *Challis, J.* Ph. Mg. 33 (1848) 98-.
- Calculation of experiments. *Moll, G.* Hall Bij. 2 (1826) 375-.
- Circular waves. *Caligny, A. de.* (ix) Par. S. Phlm. Bil. 4 (1867) 98-.
- Dalton's theory, and velocity of sound. *Benzenberg, J. F.* Gilbert A. 42 (1812) 155-; Bb. Brit. 52 (1813) 388-.
- Depth of wells by velocity of sound. *Muncke, G. W.* Gilbert A. 42 (1812) 387-.

## DOPPLER'S PRINCIPLE.

- (Theory of coloured light of double stars.) *Doppler, C.* Böhm. Gs. Ab. 2 (1841-42) 465-.
- (Deviation of rays of light and sound by rotation of medium of propagation.) *Doppler, C.* [1843] Böhm. Gs. Ab. 3 (1843-44) 417-.
- (Acoustic experiments on railways, and Doppler's theory.) *Buys-Ballot, C. H. D.* Pogg. A. 66 (1845) 321-.
- (Motion of sounding body producing change of note.) *Fizeau, H. I.* [1848] Par. S. Phlm. - PV. (1848) 81-; (vii) A. C. 19 (1870) 211-.
- Russell, J. S. B. A. Rp.* (1848) (pt. 2) 37-.
- (Influence of motion on intensity of sounds.) *Doppler, C.* Wien Sb. (1851) (Ab. 2) 162-.

## 9210 Velocity of Sound.

- Young, (Dr.) T.* R. I. J. 1 (1802) 214-.
- (Lecture by Olbers.) *Benzenberg, J. F.* Gilbert A. 49 (1815) 154-.
- Poisson, S. D.* A. C. 23 (1823) 5-; Con. des Temps (1826) 257-.

## 9210 Doppler's Principle

- (Alteration of tone and colour by motion.)  
*Mach, E.* Wien SB. 41 (1860) 543-.  
*Beetz, W.* A. Ps. C. 130 (1867) 587-.  
*Volpicelli, P.* Rm. At. N. Linc. 23 (1869) 232-.  
*Mayer, A. M.* Am. J. Sc. 3 (1872) 267-; 4 (1872) 264-; C. R. 74 (1872) 747-.  
*Radau, R.* Carl Rpm. 8 (1872) 46-.  
*(Radau.) Mayer, A. M.* Am. J. Sc. 4 (1872) 198-.  
*Schtügel, —.* A. Ps. C. 150 (1873) 356-.  
*[Eötvös non] Eötvös, (Baron) R.* A. Ps. C. 152 (1874) 513-.  
*Hoorweg, J. L.* Arch. Néerl. 9 (1874) 1-.  
*(Eötvös.) Ketteler, E.* A. Ps. C. 154 (1875) 260-.  
*(Ketteler.) Eötvös, (báró) L. (xii) Mag. Tud. Ak. Éts. 9 (No. 9) (1875) 157-.*  
 (Railway-whistles, variation of pitch on trains meeting.) *Pole, W.* Nt. 11 (1875) 232-.  
*Vogel, H. C.* A. Ps. C. 158 (1876) 287-.  
*Bichat, E.* Nancy S. Sc. Bll. 4 (11<sup>e</sup> Ann.) (1878) 5-.  
*Dufour, C.* Arch. Sc. Ps. Nt. 24 (1890) 242-.  
*Wyatt, G. H.* Nt. 42 (1890) 7-.  
*Perman, E. P.* Nt. 42 (1890) 54.  
*Everett, J. D.* Nt. 42 (1890) 81.  
*Stewart, R. W.* [1890] Nt. 43 (1891) 80.  
 (Displacement of sonorous bodies.) *Galopin, C.* Arch. Sc. Ps. Nt. 30 (1893) 320-.  
*Walter, A.* Mh. Mth. Ps. 5 (1894) 151-.  
*Michelson, V. A.* Rs. Ps. C. S. J. 31 (Ps.) (1899) 119-; Fsch. Ps. (1899) (Ab. 1) 662.  
 Echo and moving sound-source, difference of pitch. *Richardz, F.* N.-Vorp. Mt. 31 (1900) 205-.
- Earth waves. *Abbot, H. L.* Am. J. Sc. 15 (1878) 178-.
- Equilibrium, general law, and motion of solid and liquid bodies. *Wertheim, G.* Wien SB. 5 (1850) (Ab. 2) 19-.

### EXPERIMENTS.

- (Solids.) *Biot, J. B.* [1808] Arueil Mm. Ps. 2 (1809) 405-.  
*Benzenberg, J. F.* Gilbert A. 35 (1810) 388-; 37 (1811) 221-.  
*Gilbert, L. W.* (vi Adds.) Gilbert A. 44 (1813) 177-.  
 (French Academy.) *Benzenberg, J. F.* Gilbert A. 46 (1814) 325-.  
*Bauza, F., & Espinosa, J.* A. C. 7 (1817) 93-.  
*Arago, D. F. J.* A. C. 20 (1822) 210-.  
*Goldingham, J.* Phil. Trans. (1823) 96-.  
*Gregory, O.* [1823] Camb. Ph. S. T. 2 (1827) 119-.  
*Beek, A. van, & Moll, G.* Phil. Trans. (1824) 424-.  
*Moll, G.* Thomson A. Ph. 10 (1825) 268-; Hall Bij. 1 (1826) 191-.  
*Stampfer, S.* Wien Jb. Pol. I. 7 (1825) 28-.  
*Foster, H., & Parry, W. E.* Ph. Mg. 1 (1827) 12-.  
 (Observations of Bauza and Espinosa.) *Oltmanns, J.* Crelle J. 2 (1827) 307-.  
 (Foster and Parry.) *Moll, G.* Phil. Trans. (1828) 97-.

## Velocity of Sound 9210

- (Van Beek and Moll.) *Simons, G.* Phil. Trans. (1830) 209-; Amst. N. Vh. 3 (1831) 95-.  
*Bravais, A., & Martins, —.* C. R. 19 (1844) 1164-; A. C. 13 (1845) 5-.  
*Stone, E. J.* [1871] Phil. Trans. 162 (1872) 1-.  
*Blaikley, D. J.* L. Ps. S. P. 5 (1884) 319-; Ph. Mg. 16 (1883) 447-; L. Ps. S. P. 6 (1885) 228-; Ph. Mg. 13 (1884) 328-.  
 lecture-. *Rücker, A. W.* L. Ps. S. P. 9 (1888) 259-.  
 —. *Aignan, —, & Chabot, —.* J. de Ps. 4 (1895) 321-.
- Explosion waves. *Mach, E.* Wien An. 13 (1876) 193-.  
 —. *Mach, E., & Sommer, J.* Wien Ak. Sb. 75 (1877) (Ab. 2) 101-.  
 —. *Fonseca Benevides, F. da.* Lisb. J. Sc. Mth. 7 (1880) 166-.  
 —. *Berthelot, M.* C. R. 93 (1881) 18-; 94 (1882) 149-; 96 (1883) 672-.  
 —. effect of co-volumes of gases on. *Vieille, —.* C. R. 112 (1891) 49-.  
 —. in solids and liquids. *Berthelot, M.* C. R. 100 (1885) 314-; A. C. 6 (1885) 556-; 23 (1891) 485-; Par. S. C. Bll. 5 (1891) 558-.  
 Formula. *Moutier, J.* C. R. 71 (1870) 846-.  
 Guns. *Strantz, F. von.* Bresl. Schl. Gs. Übs. (1839) 54-.  
 —. *Journée, —.* C. R. 106 (1888) 244-.  
 —. *Labouret, — de.* C. R. 106 (1888) 934-; 107 (1888) 85-.
- Heat, mechanical theory applied to velocity of sound. *Dupré, A.* C. R. 64 (1867) 350-.  
 — radiation, effect on velocity of sound. *Stokes, G. G.* Ph. Mg. 1 (1851) 305-.
- Intensity, effect on velocity. *T., M. F.* QJ. Sc. (1828) (Pt. 1) 216-.  
 —, — —. *Kayser, H.* A. Ps. C. 6 (1879) 465-.
- Longitudinal and transverse waves, velocity calculated by rate of transfer of energy. *Poynting, J. H.* [1883] Birm. Ph. S. P. 4 (1885) 55-.
- Loud sounds. *Jacques, W. W.* Am. J. Sc. 17 (1879) 116-.
- Media at rest. *Vieille, P.* C. R. 126 (1898) 31-.  
 — — —, propagation of discontinuities in. *Vieille, P.* C. R. 127 (1898) 41-.
- Modulus of elasticity of air, and velocity of sound. *Tredgold, T.* Tilloch Ph. Mg. 52 (1818) 214-.  
 — — — — rod from musical note. *Bell, A.* Camb. and Dubl. Mth. J. 3 (1848) 63-.
- Molecular velocity of gases and velocity of sound. *Roiti, A.* [1876] Rm. R. Ac. Linc. Mm. 1 (1877) 39-.  
 — — — — — (Roiti). *Brusotti, F.* Mil. I. Lomb. Rd. 10 (1877) 209-.  
 — — — — — (Brusotti). *Roiti, A.* Rm. R. Ac. Linc. T. 1 (1877) 171-.
- Percussion. *Mach, E.* Wien Ak. Sb. 97 (1889) (Ab. 2a) 1045-; 98 (1890) (Ab. 2a) 1257-.  
 —. *Oekinghaus, E.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 437-.

## 9210 Velocity of Sound

## In Tubes 9210

- Plane air waves of finite velocity. *Riemann, B.* Gött. Ab. 8 (*Mth.*) (1858-59) 43-.
- and spherical waves of finite amplitude. *Burton, C. V.* L. Ps. S. P. 12 (1894) 161-; Ph. Mg. 35 (1893) 317-.
- Rankine's investigation. *Everett, J. D.* [1888] Nt. 39 (1889) 31.
- (Everett). *Lodge, O. J.* [1888] Nt. 39 (1889) 79-.
- Simple deduction. *Weyrauch, J. J.* A. Ps. C. 23 (1884) 147-.
- Sound and other vibrations. *Tillmann, S. D.* Les Mondes 8 (1865) 256-.
- Temperature effects, and Bianconi's experiments (1740). *Govi, G.* Rm. R. Ac. Linc. T. 7 (1883) 91-.
- and pressure, variation effects. *Herapath, J.* Gleanings Sc. 2 (1830) 307-.
- table ( $-10^{\circ}$  to  $+30^{\circ}$  R). *Benzenberg, J. F.* Gilbert A. 39 (1811) 136-.
- , variation effects. *Ivory, J.* Ph. Mg. 1 (1827) 249-.
- Temperatures, high, velocity at. *Benzenberg, J. F.* Gilbert A. 42 (1812) 1-, 12-, 30-.
- Airy, G. B.* Ph. Mg. 34 (1849) 401-.
- (Stokes.) *Challis, J.* Ph. Mg. 34 (1849) 449-.
- (Challis.) *Stokes, G. G.* Ph. Mg. 34 (1849) 501-.
- (Solution of problem founded on atomic constitution of fluids.) *Potter, R.* Ph. Mg. 1 (1851) 101-.
- (La Place's theory.) *Rankine, W. J. M.* Ph. Mg. 1 (1851) 225-.
- (— —.) (Rankine.) *Potter, R.* Ph. Mg. 1 (\*1851) 317-.
- (Potter.) *Haughton, S.* Ph. Mg. 1 (1851) 332-.
- Challis, J.* Ph. Mg. 1 (1851) 405-.
- (Poisson's investigation, Potter's criticism.) *Rankine, W. J. M.* Ph. Mg. 1 (1851) 410-.
- (La Place's theory.) *Waterston, J. J.* Ph. Mg. 16 (1858) 481-.
- (Mathematical theory.) *Earnshaw, S.* [1858-59] B. A. Rp. (1858) (pt. 2) 34-; Phil. Trans. (1860) 133-.
- Earnshaw, S.* Ph. Mg. 19 (1860) 449-; 20 (1860) 186-.
- (La Place's correction.) *Le Conte, (Prof.) J.* [1861] (viii) Ph. Mg. 27 (1864) 1-.
- (— —.) *Tyndall, J.* (viii) Ph. Mg. 26 (1863) 384-; 27 (1864) 41-.
- Challis, J.* Ph. Mg. 27 (1864) 92-.
- (La Place's correction.) (Le Conte.) *Earnshaw, S.* Ph. Mg. 27 (1864) 98-.
- (— —.) (—.) *Potter, R.* Ph. Mg. 27 (1864) 104-.
- Bosanquet, R. H. M.* Ph. Mg. 3 (1877) 271-, 343-, 418-; 4 (1877) 25-, 125-, 216-.
- Thunder. *Earnshaw, S.* B. A. Rp. (1860) (pt. 2) 58.
- *Montigny, C.* Brux. Ac. Bil. 9 (1860) 86-.
- , intensity and velocity. *Laurent, Albert.* Moigno Cosmos 17 (1860) 7-.

## THEORY.

- (Is heat set free in sound?) *Wrede, E. F.* Gilbert A. 18 (1804) 401-.
- (Theory and experiment compared.) *Prechtel, J. J.* Gilbert A. 21 (1805) 449-.
- Poisson, S. D.* [1807] Par. Éc. Pol. J. 14<sup>e</sup> cah. (1808) 319-.
- Araldi, M.* Bologna Mm. I. It. 2 (1808) 311-, 431-.
- (Correction.) *La Place, P. S. (marquis) de.* A. C. 3 (1816) 238-.
- (Theory and experiment compared.) *Fischer, E. G.* Berl. Ab. (1816-17) (Ps.) 63-.
- (La Place's theorem.) *Tralles, J. G.* Gilbert A. 65 (1820) 43-.
- (Application of theory of elastic fluids.) *La Place, P. S. (marquis) de.* Par. S. Phlm. Bil. (1821) 161-.
- La Place, P. S. (marquis) de.* A. C. 20 (1822) 266-.
- (Specific heat of elastic fluids.) *Dulong, P. L.* [1823] Par. Mm. Ac. Sc. 10 (1831) 147-.
- (— — — —.) (Dulong.) *Simons, G.* Phil. Trans. (1830) 209-; Amst. N. Vh. 3 (1831) 95-.
- (Theory and experiment compared.) *Ritchie, W.* R. S. P. 3 (1837) 458.
- Joule, J. P.* Ph. Mg. 31 (1847) 114-.
- Challis, J.* Ph. Mg. 32 (1848) 276-.
- (Challis.) *Airy, G. B.* Ph. Mg. 32 (1848) 339-.
- (Airy.) *Challis, J.* Ph. Mg. 32 (1848) 494-.
- (Challis.) *Moon, R.* [1848] (viii) Camb. Ph. S. P. 1 (1866) 75.
- Stokes, G. G.* Ph. Mg. 33 (1848) 349-.
- Challis, J.* Ph. Mg. 34 (1849) 88-.
- (Challis.) *Stokes, G. G.* Ph. Mg. 34 (1849) 203-.
- (Stokes.) *Challis, J.* Ph. Mg. 34 (1849) 284-.
- (Challis.) *Stokes, G. G.* Ph. Mg. 34 (1849) 348-.

VELOCITY OF SOUND IN AIR  
IN TUBES.

- Kundt, A.* Berl. Mb. (1867) 858-; A. Ps. C. 135 (1868) 337-, 527-.
- Schneebeli, H.* A. Ps. C. 136 (1869) 296-.
- Seebeck, A.* A. Ps. C. 139 (1870) 104-.
- Bourget, J.* C. R. 73 (1871) 1203-.
- Tumirz, O.* [1879] Wien Ak. Sb. 80 (1880) (Ab. 2) 439-.
- Baille, J. B.* As. Fr. C. R. (1885) (Pt. 1) 104-; J. de Ps. 6 (1887) 498-.
- Cylindrical tubes. *Leroux, F. P.* C. B. 55 (1862) 662-; 64 (1867) 392-; A. C. 12 (1867) 345-.
- *Violle, —.* As. Fr. C. R. (1890) (Pt. 1) 169-.
- , bend, acoustic value. *Leroux, F. P.* A. C. 12 (1867) 409-.
- Elastic tubes. *Korteweg, D. J.* A. Ps. C. 5 (1878) 525-.



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Elastic tubes. *Lamb, H.* *Manch. Lt. Ph. S. Mm. & P.* 42 (1898) No. 9, 16 pp.  
Narrow tubes. *Blakley, D. J.* *Ph. Mg.* 7 (1879) 339-.

### VELOCITY OF SOUND IN VARIOUS MEDIA.

Air, compressed. *Witkowski, A. W.* [1899] *Krk. Ak. (Mt.-Prz.) Rz.* 19 [20] (1902) 1-; *Cro. Ac. Sc. Bil.* (1899) 138-.  
—, gases and vapours, for pure notes of different pitch. *Low, J. W.* *Ph. Mg.* 38 (1894) 249-.  
—, rarefied, in tubes. *Stolétov, A. G.* *Rs. Ps.-C. S. J.* 18 (Ps.) (1896) 65-; *J. de Ps.* 6 (1887) 203.  
Alloys. *Gerosa, G. G.* *Bm. R. Ac. Linc. Rd.* 4 (1888) (Sem. 1) 127-.  
Bar, prismatic, elastic. *Saint Venant, Barré de.* *C. R.* 64 (1867) 1192-.  
Chlorine. *Martini, T.* *Ven. I. At.* 7 (1880-81) 491-, 639-.  
Ebonite. *Campanile, F.* *Nap. Rd.* 33 (1894) 68-.  
Gases. *Stefan, J.* *Pogg. A.* 118 (1863) 494-.  
—, *Regnault, V.* *C. R.* 66 (1868) 209-; *Par. Ac. Sc. Mm.* 37 (1868) 3-.  
— (Regnault). *Breton, P.* *Les Mondes* 16 (1868) 351-.  
— (—). *Radau, R.* *Carl Rpm.* 4 (1868) 133-.  
— (—). *Rink, H. J.* [1872] *Arch. Néerl.* 8 (1873) 25-.  
—, *Martini, T.* *Ph. Mg.* 39 (1895) 142-.  
—, differences of velocity in, illustration. *Gibbes, L. R.* *Am. As. P.* (1850) 115-.  
—, hot, velocity of waves of compression in. *Le Chatelier, H. C. R.* 131 (1900) 30-.  
— and metals. *Pazienti, A.* *Ven. Mm.* 12 (1864) 447-.  
—, mixed. *Dvořák, V.* (ix) *Wien Az.* 10 (1873) 186-.  
— and solids, difference of velocity in, experiment. *Griveaux, F.* *J. de Ps.* 2 (1883) 228-.  
— — and liquids. *Masson, A.* *C. R.* 44 (1857) 464-; *A. C.* 53 (1858) 257-.  
—, velocity of sound and molecular motion in. *Mulder, E.* *A. Ps. C.* 140 (1870) 288-.  
—, — — in, and their molecular weight, relations. *Bender, Carl.* *D. C. Gs. B.* 6 (1873) 665-.  
Hydrogen gas. *Leslie, John.* [1821] *Camb. Ph. S. T.* 1 (1822) 267-.  
Iron. *Breguet, L., & Wertheim,* —. *C. R.* 32 (1851) 293-.  
Liquid and solid bodies of limited dimensions. *Rankine, W. J. M.* *Camb. and Dubl. Mth. J.* 6 (1851) 238-.  
Liquids. *Wertheim, G.* *C. R.* 27 (1848) 150-; *A. C.* 23 (1848) 434-.  
—, *Potter, R.* *Ph. Mg.* 1 (1851) 319-.  
—, *Martini, T.* *Ven. I. At.* (1885-86) *App.* 87 pp.  
Metals, specific heat and sound velocity. *Poulsen, V.* *N. Ts. Fa. K.* 2 (1897) 374-; *C. Ztg.* 21 (1897) (Rpm.) 305.  
Rods. *Wertheim, G.* *A. C.* 31 (1851) 86-.

## Reflection of Sound 9220

Solids (lecture experiments). *Gezochus [Herschus], N.* *Rs. Ps.-C. S. J.* 17 (Ps.) (1885) 326-; *Exner Rpm.* 23 (1887) 242-.  
Vapours. *Neyreneuf, V.* *A. C.* 9 (1886) 535-.  
—, *Gerosa, G. G., & Mai, E.* *Rm. R. Ac. Linc. Rd.* 4 (1888) (Sem. 1) 728-, 800-.  
Water. *Langlois, M.* *C. R.* 102 (1886) 1451-.  
— in pipes. *André, F.* *C. R.* 70 (1870) 568-.  
— — —. *Dvořák, V.* *Wien Ak. Sb.* 70 (1874) (Ab. 2) 522-.  
—, sea, velocity of vibrations of large amplitude in. *Threlfall, R., & Adair, J. F.* *R. S. P.* 46 (1890) 496-.  
Wires, stretched, velocity of mechanical impulse in. *Meyer, S.* *Wien Ak. Sb.* 105 (1896) (Ab. 2a) 1015-.  
Wood. *Kayser, H.* *Am. J. Sc.* 23 (1882) 415-.

## 9220 Reflection and Refraction of Sound. (See also 9040.)

(Motion of 2 elastic superposed fluids.) *Poisson, S. D.* [1823] *Par. Mm. Ac. Sc.* 10 (1831) 817-.  
*Green, G.* [1837] *Camb. Ph. S. T.* 6 (1838) 403-.  
*Fischer, A., & Mach, E.* *Wien Sb.* 67 (1873) (Ab. 2) 81-.  
(Reflection and refraction by heated gas.) *Cottrell, J.* *R. S. P.* 22 (1874) 190-.

### REFLECTION.

*Vionnois,* —. *C. R.* 60 (1865) 458.  
*Sharpe, H. J.* *Mess. Mth.* 2 (1873) 159-.  
*Rayleigh, (Lord).* *Ph. Mg.* 3 (1877) 458-.  
and absorption by porous and pervious materials. *Tufts, F. L.* [1899] *N. Y. Ac. A.* 12 (1899-1900) 621.  
— diffraction. *Seebeck, A.* *Pogg. A.* 59 (1843) 177-.  
echo in church, *Girgenti, Actis, (l'abbé)* —. *Turin Mm. Ac.* 4 (1788-89) 43-.  
—, depth of sea determined by. *Bonnycastle, C.* *Franklin I. J.* 24 (1839) 351-.  
— and moving sound source, difference of pitch. *Richarz, F.* *N.-Vorp. Mt.* 31 (1900) 205-.  
— at Muiderberg. *Buys, J. [ & Dijk, P. W. L. van].* *Haarl. Vh.* 6 (1812) 123-.  
— — —. *Marum, M. van.* *Haarl. Vh.* 6 (1812) 154-.  
— and thunder roll. *Reis, Paul.* (xii) *Humb.* 2 (1883) 215-.  
echoes, mountain, and Kent bugle. *Scoresby, (Rev.) W.* *Edinb. N. Ph. J.* 6 (1829) 371-.  
by flames and heated gases. *Mayer, A. M.* *Am. J. Sc.* 8 (1874) 362-.  
harmonic overtones produced by. *Oppel, J. J.* (xii) *Frkf. a. M. Ps. Vr. Jbr.* (1863-64) 70-.  
method of studying. *Rood, O. N.* *Am. J. Sc.* 19 (1880) 133-.

9220 Reflection and Refraction of Sound Interference of Sound 9230

of motion of elastic fluids in pipes, and theory of wind instruments. *Poisson, S. D.* [1818-19] *Par. Ac. Sc. Mm.* 2 (1819) 305-.

multiple. *Fabri, R.* *Rm. At.* 13 (1859-60) 293-.

—, tone due to. *Baumgarten, A.* [1876] *Innsb. Nt. Md. B.* 7 (1877) (*Heft* 1) 116-.

phenomenon. *Oppel, J. J.* *Frkf. Jbr. Ps. Vr.* (1858-59) 39-.

—, *French, A.* *Nt.* 12 (1875) 46-.

—, *Högyes, E.* *Termt. Közl.* 18 (1896) 179-.

— in church at Box. *Dufour, C.* *Laus. S. Vd. Bll.* 15 (1878) 333-.

pitch alteration in. *Oppel, J. J.* (*vi Add.*) *Frkf. Jbr. Ps. Vr.* (1853-54) 40-.

by a plane. *Abt, A.* *Exner Rpm.* 21 (1885) 503-.

polarisation by. *Wheatstone, (Sir) C. Thomson A. Ph.* 6 (1823) 87-.

—, *Kämtz, L. F.* *Schweigger J.* 42 (= *Jb.* 12) (1824) 197-.

—, *Weber, W. E.* *Schweigger J.* 46 (= *Jb.* 16) (1826) 108-.

—, *Robinson, S. W.* *Franklin I. J.* 81 (1881) 201-.

—, analogous to optical polarisation. *Macé de Lépinay, J.* *Par. S. Ps. Sé.* (1888) 327-.

reflection tones. *Oppel, J. J.* *Pogg. A.* 101 (1857) 105-; 147 (1872) 369-.

—, *Reuleaux, H.* *Bonn NH. Vr. Vh.* 41 (1884) 278-.

—, and tuning fork test. *Oppel, J. J.* (*xii*) *Frkf. a. M. Ps. Vr. Jbr.* (1862-63) 14-.

—, use in estimating dimensions. *Oppel, J. J.* (*xii*) *Frkf. a. M. Ps. Vr. Jbr.* (1860-61) 53-.

reverberant mountains, Thuringia. *Jacobs, —.* *Zach M. Cor.* 27 (1813) 418-.

sound shadow. *Lungo, C. del.* *Rv. Sc. Ind.* 29 (1897) 268.

—, visibility. *Boys, C. V.* *Nt.* 56 (1897) 173-.

— velocity by Fizeau's method for light. *Nardroff, E. R. von.* [1900] *N. Y. Ac. A.* 13 (1900-01) 494-.

sounding-board in Attercliffe Church. *Blackburn, J.* *Phil. Trans.* (1828) 361-.

in tubes. *Halsch, F.* [1886] *Wien Ak. Sb.* 94 (1887) (*Ab.* 2) 763-.

velocity of sound produced by percussion. *Mach, E.* *Wien Ak. Sb.* 97 (1889) (*Ab.* 2a) 1045-; 98 (1890) (*Ab.* 2a) 1257-.

REFRACTION.

*Sondhauss, C.* *Bresl. Schl. Gs. Übs.* (1851) 27-; *Pogg. A.* 85 (1852) 378-.

*Hajech, C.* *Mil. G. I. Lomb.* 8 (1856) 406-; *Mil. At. I. Lomb.* 1 (1858) 448-.

*Taylor, W. B.* *Smiths. Rp.* (1875) 205-.

*Boehm, E. E., & Schellbach, K. H.* *A. Ps. C.* 8 (1879) 645-.

*Reis, Paul.* (*xii*) *Humb.* 2 (1883) 138-.

*Neyreneuf, —.* *As. Fr. C. R.* (1894) (*Pt.* 2) 352-.

by air-strata of unequal temperature. *Fizeau, H.* *C. R.* 104 (1887) 1347-.

atmospheric. *Reynolds, O.* *R. S. P.* 22 (1874) 295-, 531-.

—, *Schuster, A.* [1875] *Nt.* 13 (1876) 67.

—, *Reynolds, O.* [1876] *Phil. Trans.* 166 (1877) 315-.

—, *Kneser, A.* *A. Ps. C.* 11 (1880) 516-.

—, and total reflection, theory; and importance for navigation. *Matthiessen, L.* *Ac. Nt. C. N. Acta* 74 (1899) 457-.

audibility of sounds, and wind-refraction. *Reis, Paul.* (*xii*) *Humb.* 2 (1883) 53-.

deflection. *Fuchs, —.* *Humb.* 9 (1890) 63-.

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by sensitive flames. *Gezechus [Hesehus], N. A.* *Rs. Ps.-C. S. J.* 17 (*Ps.*) (1885) 332.

and velocity of sound in sound-transparent bodies. *Gezechus [Hesehus], N.* *Rs. Ps.-C. S. J.* 22 (*Ps.*) (1890) 233-; *Exner Rpm.* 27 (1891) 471-.

by wind. *Delaroché, F.* [1813] *A. C.* 1 (1816) 176-.

—, *Haldat du Lys, C. N. A. de.* *J. de Ps.* 79 (1814) 285-.

—, *Rees, R. van.* *Quetelet Cor. Mth.* 2 (1826) 22-.

—, *Stokes, G. G.* *B. A. Rp.* (1857) (*pt.* 2) 22-.

—, *Vargiu, G. I.* *Les Mondes* 9 (1866) 95-.

—, *Barton, E. H.* [1900] *L. Ps. S. P.* 17 (1901) 534-.

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*Addams, R.* *B. A. Rp.* (1834) (*pt.* 2) 557.

*Kane, (Sir) R. J.* *B. A. Rp.* (1835) (*pt.* 2) 13-.

*Dove, H. W.* *Pogg. A.* 44 (1838) 272; *Berl. Mb.* (1857) 291-.

*Fabri, R.* *Rm. At.* 12 (1858-59) 297-.

*Deneke, F.* [1864] *Danzig Schr.* 1 (*Heft* 2) (1865) 4 pp.

*Kahl, E.* *Z. Mth. Ps.* 11 (1866) 170-.

*Mees, R. A.* (*xii*) *Mbl. Nt.* 4 (1874) 77-.

*Mach, E., & Mach, L.* *Wien Ak. Sb.* 98 (1890) (*Ab.* 2a) 1333-.

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—, *Quincke, G.* *A. Ps. C.* 128 (1866) 177-.

—, *Stefan, J.* *Wien Sb.* 56 (1867) (*Ab.* 2) 561-.

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- *Righi, A.* Bologna Ac. Sc. Mm. 2 (1891) 261-.
- *Slotte, K. F.* Helsingf. Öfv. 88 (1896) 86-.
- application of law to combination-tones. *Poggendorff, J. C.* Pogg. A. 32 (1834) 520-.
- and consonance and absorption in sound and light, pendulum experiments. *Isenkrahe, C.* Carl Rpm. 16 (1880) 99-, 516-.
- disturbance by an element of plane wave of sound or light. *Basset, A. B.* L. Mth. S. P. 22 (1891) 317-.
- of electric explosions. *Waha, M. de.* Lux. I. Pb. 16 (1877) 49-.
- experiment, lecture-. *Terquem, A.* J. de Ps. 6 (1877) 316-.
- experiments. *Villari, E.* Bologna Ac. Sc. Mm. 1 (1890) 673-.
- with sensitive flames. *Gezechus [Hesehus].* N. Rs. Pa. C. S. J. 24 (Ps.) (1892) 156-; J. de Ps. 2 (1893) 528.
- vowels. *Sauberschwartz, E.* Pflüg. Arch. Pl. 61 (1895) 1-.
- of longitudinal waves, construction for. *Matthes, C. J.* Arch. Mth. Ps. 49 (1869) 486-.
- observed with membrane. *Weber, W. E.* Schweigger J. 50 (= Jb. 20) (1827) 247-.
- phenomena due to concurrence of 2 sounds. *Radau, R.* Mon. Sc. 18 (1876) 323-.
- secondary tones made audible by. *Dove, H. W.* Berl. Mb. (1862) 97-.
- by telephone. *Cook, C. S.* Science 1 (\*1883) 167-.
- tubes, Nörremberg's. *Müller, (Dr.) J.* [1854] Freiburg B. 1 (1858) 43-.
- of tuning fork (intensity in different directions). *Chladni, E. F. F.* Kastner Arch. Ntl. 7 (1826) 92-.
- — — — —. *Chladni, E. F. F., & Sömmerring, W.* Kastner Arch. Ntl. 8 (1826) 91-.
- — — — —. *Addams, R.* (vi Add.) W. Eng. J. 1 (1836) 60-.
- — — — —. *Kiessling, H.* A. Ps. C. 130 (1867) 177-.
- 2 tuning forks. *Grüel, C. A.* Pogg. A. 104 (1858) 494-.
- near wall from which sound is reflected. *Rayleigh, (Lord).* Ph. Mg. 7 (1879) 150-.
- “wandering tones.” *Reuleaux, H.* Bonn NH. Vr. Vh. 37 (1880) 161-; Bonn Niedr. Gs. Sb. (1881) 116-.
- wave-length of sound by grating method. *Nardroff, E. R. von.* [1900] N. Y. Ac. A. 13 (1900-01) 511-.

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- Ohm, G. S.* Pogg. A. 47 (1839) 463-.
- Fabri, R.* Rm. At. N. Linc. 17 (1864) 235-.
- beat tone apparatus for lectures. *König, R. A.* Ps. C. 12 (1881) 350-.
- and beat tones of one body. *König, R. A.* Ps. C. 39 (1890) 395-.
- beat tones, cerebral origin. *Schaefer, K. L.* Z. Psychol. 4 (1893) 348-; 5 (1893) 397-.
- — — — —. *Scripture, E. W.* Ph. Stud. 8 (1893) 638-.

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- and beat tones due to harmonic intervals. *König, R. A.* Ps. C. 12 (1881) 335-.
- beat tones of very high frequency, and dust figures produced by them. *König, R. A.* Ps. C. 69 (1899) 626-, 721-.
- — — from 2 vibrating bodies which are separately inaudible because of their high frequency. *Mayer, A. M.* B. A. Rp. (1894) 578.
- and combination tones, and Tartini's tones. *Crotti, P.* (xii) Rv. Sc.-Ind. 12 (1880) 401-, 470-.
- — — — —, theory. *Radau, R.* Les Mondes 8 (1865) 9-, 52-.
- of consonances of form  $h : l$ . *Bosanquet, R. H. M.* L. Ps. S. P. 4 (1881) 221-; Ph. Mg. 11 (1881) 420-, 492-.
- and difference tones, appreciation. *Scripture, E. W.* Ph. Stud. 7 (1892) 630-.
- — — — —, perception and localisation. *Schaefer, K. L.* Z. Psychol. 1 (1890) 81-.
- of Hawkes's douzeave. *B., J.* Tilloch Ph. Mg. 37 (1811) 128-.
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- — — — —. *Thomson, (Sir) W.* Edinb. R. S. P. 9 (1878) 602-.
- — — — —. *Bosanquet, R. H. M.* Ph. Mg. 12 (1881) 434-; 13 (1882) 181.
- — — — —. *Thompson, S. P.* Ph. Mg. 13 (1882) 68-.
- — — — —, history of theory. *Bosanquet, R. H. M.* Ph. Mg. 12 (1881) 270-.
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- method of producing. *Athanasiaides, G. A.* Ps. 3 (1900) 753.
- musical. *Pole, W.* Nt. 13 (1876) 212-, 232-.
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- — — — —. *Weber, W. E.* Pogg. A. 15 (1829) 216-.
- — — — —. *Helmholtz, H.* Rheinl. Westphal. Sb. 13 (1856) lxxv-.
- — — — —, mathematical theory. *Hopkinson, J.* Mess. Mth. 2 (1873) 24-.
- — — — —, objective existence. *Dove, H. W.* Pogg. A. 107 (1859) 652-.
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- — — — —, and application to tuning of organs, etc. *Vincent, A. J. H.* A. C. 26 (1849) 37-.
- — — — —, König's. *Molloy, G.* Nt. 42 (1890) 246.
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- — — — — tuning forks. *Villari, E.* Bologna Ac. Sc. Mm. 2 (1872) 309-.
- — — — —, and method of tuning to unison. *Spice, R.* Am. J. Sc. 11 (1876) 372.
- — — — —, microphone observations. *Tuma, J.* Wien Ak. Sb. 98 (1890) (Ab. 2a) 1028-.

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variation of pitch. *Taylor, S.* Ph. Mg. 44 (1872) 56-.  
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*Serrano y Fatigati, E.* Arch. Sc. Ps. Nt. 49 (1874) 151-.  
*Jacques, W. W.* Am. Ac. P. 11 (1876) 269-.  
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acoustic shadow of circular disk. *Rayleigh, (Lord).* Ph. Mg. 9 (1880) 281-.  
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*Duff, A. W.* Ps. Rv. 11 (1900) 65-.  
Audibility and dispersion of sound in air. *Krass, —.* [1897] Westf. Vr. Jbr. (1897-98) 149-.  
— of sound, balloon experiments. *Bacon, (Rev.) J. M.* Nt. 60 (1899) 484.  
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—, —, due to internal friction. *Stefan, J.* Wien Sb. 53 (1866) (Ab. 2) 529-.  
— with distance. *Schaefer, K. L. A. Ps. C.* 57 (1896) 785-.  
— in human body. *Vierordt, K. von.* Z. Bl. 19 (1883) 101-.  
— soft bodies. *Warburg, E. A. Ps. C.* 136 (1869) 285-.  
— solid bodies, due to internal resistance. *Warburg, E.* Berl. Mb. (1869) 538-; A. Ps. C. 139 (1870) 89-.  
— of sound, and air radiation constant. *Duff, A. W.* Ps. Rv. 6 (1898) 129-; Am. As. P. (1899) 125-.  
— — — thermal conductivity. *Brunhes, B. J. de Ps.* 6 (1897) 289-.  
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Diminution of velocity of sound in narrow tubes. *Schmeebeli, H.* A. Ps. C. 136 (1869) 296-.  
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— — — by fog. *Reynolds, O.* [1873] Manch. Lt. Ph. S. P. 13 (1873-74) 43-.  
— — — — heterogeneous liquids. *Baudrimont, E.* J. Phm. 31 (1857) 363-.  
Heat conduction, effect on sound in gas. *Kirchhoff, G. A. Ps. C.* 134 (1868) 177-.  
— production by sound. *Warburg, E. A. Ps. C.* 137 (1869) 632-.  
Ratio of specific heats in argon. *Rayleigh, (Lord), & Ramsay, W.* [1895] Phil. Trans. (A) 186 (1896) 187-.  
— — — — mercury vapour. *Kundt, A., & Warburg, E.* Berl. Ak. Mb. (1875) 160-.  
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## 9250 Acoustic Transparency.

*Tyndall, J.* R. S. P. 22 (1874) 58-; Phil. Trans. 164 (1874) 183-; R. S. P. 22 (1874) 359.  
(Tyndall.) *Fonvielle, W. de.* C. R. 78 (1874) 299-.  
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—, recognition of sound source in. *Serpette, (le lt.) A.* Rv. Mar. et Col. 94 (1887) 183-.  
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*Collinson, (Vice-Adml.) R.* [1875] Un. Serv. I. J. 19 (1876) 465-.  
*Henry, J.* [1877] Wash. Ph. S. Bll. 2 (1875-80) 162-.  
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Columns, liquid, affected by sound, structure. *Ridout, R. H.* Nt. 18 (1878) 604-.

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- Diffraction of sound. *Rayleigh, (Lord)*. [1888] R. I. P. 12 (1889) 187-.
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- Jets, air, sympathetic vibration. *Bell, C. A.* [1886] Phil. Trans. 177 (1887) 383-.
- , gas. *Govi, G. Tor. At. Ac. Sc.* 5 (1869-70) 475-.
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- , — and gaseous, action of sound vibrations on. *Tyndall, J. Ph. Mg.* 33 (1867) 375-.
- , —, recent theories. *Plateau, J. A. F. Brux. Ac. Bil.* 23 (1856) 737-.
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- Phonoscope. (Apparatus with sensitive flame.) *Forchhammer, J. G. Sk. Nf. F.* (1886) 52-; *Ts. Ps. C.* 26 (1887) 97-; *Fschr. Ps.* (1888) (Ab. 1) 466-.
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- Photographic and graphic illustration of sound waves. *Blake, C. J. Am. J. Ot.* 1 (1879) 8-, 89-.
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- — —. *Lloyd, R. J. Lpool. Lt. Ph. S.* P. 45 (1891) 139-.
- — — (by "Schlieren-Methode"). *Wood, R. W. Ph. Mg.* 48 (1899) 218-.
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- — —. *Herschel, A. S.* [1874] *Nt.* 11 (1875) 6-, 45-, 88.
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- Explosion waves, collision. *Jones, R. H., & Bower, J. Manch. Lt. Ph. S. Mm. & P.* 42 (1898) No. 7, 7 pp.

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- Stuginov, N. P. Kazan S. Nt. (Ps.-Mth.) P.* 8 (1890) 279-; *Fschr. Ps.* (1890) (Ab. 1) 507.
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*Tischer, E.* Ph. Stud. 1 (\*1883) 543-.

*Vierordt, K. von.* A. Ps. C. 18 (1883) 471-.

*Wead, C. K.* Am. J. Sc. 26 (1883) 177-.

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Chordometer and tonometer. *Luca, P. A. de.* [1827] Mod. S. It. Mm. 20 (1828) (Mat.) 468-.

Graphic methods for counting beats and vibrations of microphonic capsule. *Campanile, F.* Nap. Ac. At. 7 (1895) No. 4, 8 pp.

Isochronism of sonorous vibrations, experimental proof. *Niaudet-Breguet, A.* Les Mondes 13 (1887) 656-.

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— — — (Stumpf & Meyer). *Appunn, A.* A. Ps. C. 64 (1898) 409-.

— — — (Appunn). *Stumpf, C., & Meyer, M.* A. Ps. C. 65 (1898) 641-.

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— — — *Melde, F.* A. Ps. C. 67 (1899) 781-.

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— — — — —, unreliability. *Appunn, A.* A. Ps. C. 67 (1899) 222-.

— notes of whistle of adjustable pitch. *Shaw, W. N., & Turner, F. M.* [1887] Camb. Ph. S. P. 6 (1889) 90-.

— tuning fork pitch. *Barker, G. F.* [1878] Am. As. P. 27 (1879) 118-.

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- Cagniard-Latour, C.* A. C. 12 (1819) 167-; 18 (1821) 438-.
- Seebeck, A.* Pogg. A. 60 (1843) 449-.
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- sine. *Fuchs, Fr.* (XII) Z. Instk. 3 (1883) 270-.
- Tones of pitch from 4096 to 90000. *Koenig, R.* A. Ps. C. 69 (1899) 626-, 721-.
- Tonometer, Appunn's. *Stumpf, C.* Z. Psychol. 6 (1894) 33-.
- , —, Scheibler's, and Terquem's. *Schubring, G.* Z. Nw. 11 (1875) 240-.

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- Stevell, J.* B. A. Rp. 34 (1864) (*Secl.*) 20-.
- Schüngel, —.* A. Ps. C. 150 (1873) 356-.
- Bichat, E. J.* de Ps. 7 (1878) 330-.
- Bartoniak, G.* Mth. Term. Éts. 4 (1886) 153-; Term. Közl. 20 (1888) 203; Mth. Nt. B. Ung. 6 (1889) 436-.
- Oberbeck, —.* N.-Vorp. Mt. 25 (1894) xxiv-.
- (Lecture experiment.) *Aignan, —, & Chabot, —.* J. de Ps. 4 (1895) 321-.
- Frot, —.* C. R. 127 (1898) 609-.
- Violle, J.* [1900] Sc. Abs. 4 (1901) 595.
- adiabatic relations of ether. *Perman, E. P., Ramsay, W., & Rose-Innes, J.* [1896] Phil. Trans. (A) 189 (1897) 167-.
- apparatus. *König, R.* C. R. 55 (1862) 603-.
- *Neumann, E. C. O.* A. Ps. C. 128 (1866) 307-.
- in enclosed space. *Bosscha, J.* Pogg. A. 92 (1854) 485-.
- of explosion waves, chronographic measurements. *Smith, F. J.* R. S. P. 45 (1889) 451-.
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- *Martini, T.* Ven. I. At. (1892-93) 1113-.
- , apparatus for. *Wertheim, G.* A. C. 31 (1851) 432-.
- , and method of measuring wave-lengths. *Mayer, A. M.* Am. J. Sc. 4 (1872) 425-.
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- — — *Schleiermacher, —.* Karlsruhe Nt. Vr. Vh. 10 (1888) (*Sb.*) 169-.
- — — polyphonic echo. *Basso, G.* [1870] Tor. At. Ac. Sc. 6 (1870-71) 52-.
- principles of hydrodynamics. *Challis, J.* Ph. Mg. 34 (1849) 353-.
- reed pipes. *Aignan, —, & Chabot, —.* [1893] Bordeaux S. Sc. Mm. 5 (1895) vii-.
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- Daguin, P. A.* Toul. Mm. Ac. 3 (1865) 389-.
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- Air-columns, optical analysis of vibrations. *Tipler, A., & Boltzmann, L.* A. Ps. C. 141 (1870) 321-.
- Analysers, acoustic. *Valérius, H.* Brux. Ac. Bil. 22 (1866) 221-.
- Apparatus, König's. *Müller, Joh.* Freiburg B. 5 (1870) (*Hest 1*) 126-.
- Articulate vibrations, photographic records. *Blake, E. W.* Am. J. Sc. 16 (1878) 54-.
- Harmonic tones. *Zantedeschi, F.* Wien SB. 27 (1857) 284-.
- Instrument, new. *Daguin, P. A.* Toul. Mm. Ac. 5 (1867) 302-.
- Musical notes, graphics. *Gellé, —.* Par. S. Bl. Mm. 50 (1893) (*C.R.*) 983-.
- Objective analysis, delicate. *Lummer, O.* Berl. Ps. Gs. Vh. (1886) 66-.
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- , —. *Pringsheim, E.* Berl. Ps. Gs. Vh. (1889) 43-.
- , new. *Thompson, S. P.* [1880] (xii) Bristol Nt. S. P. 3 (1882) 114-.
- , *Osenbrück's. Pensky, B.* Z. Instk. 14 (1894) 404-.
- Stroboscopic analysis. *Töpler, A.* A. Ps. C. 128 (1866) 108-.
- Vocal curves, analysis into harmonic partial-vibrations. *Hermann, L.* [1900] Pflüg. Arch. Pl. 83 (1901) 33-.
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- Mayer, A. M.* Ph. Mg. 48 (1874) 286-, 371-, 445-, 513-; Am. J. Sc. 8 (1874) 241-; 9 (1875) 267-; 12 (1876) 329-; 47 (1894) 1-, 134.
- Izrailev, A. A.* Mosc. S. Sc. Bl. 41 (No. 2) (1884) 58-.
- Melde, F.* Humb. 5 (1886) 289-, 449-.
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- and colour, analogy. *Oppel, J. J.* (vi *Adds.*) Frkf. Jbr. Ps. Vr. (1854-55) 47-.
- , —. *Durand, A.* Les Mondes 6 (1864) 562-; 7 (1865) 508-; 8 (1865) 632-.
- , —. *Barrett, W. F.* Nt. 1 (1870) 286-.
- , —. *Deas, F.* Nt. 1 (1870) 384-.
- , —. *Stuart, J.* Nt. 1 (1870) 406.
- , —. *Taylor, S.* Nt. 1 (1870) 430-.
- , —. *Okeley, W. S.* Nt. 1 (1870) 557-.
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- , —. *Werneburg, J. F. C.* Kastner Arch. Ntl. 3 (1824) 129-.
- , —. *Helmholtz, H.* Mon. Sc. 7 (1865) 193-.
- , —, Koenig's researches. *Thompson, S. P.* [1890] Nt. 43 (1891) 199-, 224-, 249-; R. I. P. 13 (1893) 206-.
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- , mathematical. *Olio, G. dall'.* Mod. S. It. Mm. 9 (1802) 609-.
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- Euphonium, etc. *Chladni, E. F. F.* Tilloch Ph. Mg. 2 (1798) 391-; Gilbert A. 75 (1823) 69-.
- Glass harmonica, history. *Schnyder von Martensee, X.* Frkf. Ps. Vr. Jb. (1831) 174-.
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- in just intonation. *Planck, M.* Berl. Ps. Gs. Vh. (1893) 8-.
- with mathematically exact scale. *Blaserna, P.* Rm. R. Ac. Linc. Rd. 5 (1889) (*Sem.* 2) 342-.
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- , —. *Langguth, C. A.* Gilbert A. 15 (1803) 305-.
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- Imbs, J. A. Cons. Arts et Mét.* 9 (1897) 71-.
- Electric musical apparatus. *Magrini, L. Mil. I. Lomb. Rd.* 4 (1887) 349-.
- — —. *Monti, M. M. (xii) Rv. Sc.-Ind.* 5 (1873) 134-.
- Electricity applied to musical instruments. *Du Moncel, T. [A. L.] Cherb. Mm. S. Sc.* 1 (1852) 243-.
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- and melotrope (Carpentier). *Dieudonné, E. Lum. Élect.* 26 (1887) 651-.
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- Orchestra, automatic. *Gregorio, A. de. Palermo Ac. At.* 3 (1895) (Sc. Nt.) 87-.
- Organ (panharmonicon). *Mälzel, —. Gilbert A.* 26 (1807) 214-.
- , enharmonic, Liston's. *Farey, J. Tilloch Ph. Mg.* 37 (1811) 273-; 39 (1812) 373-, 419-.
- , string. (Application of wind to string instruments.) *Hamilton, J. B. R. I. P.* 7 (1875) 488-.
- , —, Hamilton's, mathematical theory. *Bosanquet, R. H. M. Ph. Mg.* 49 (1875) 98-.
- , —, — —. *Rayleigh, (Lord). Nt.* 11 (1875) 308-.
- , —, —, sounds. *Smith, Herm. Nt.* 11 (1875) 425-.
- Organs, construction. *Ferroni, P. Mod. S. It. Mm.* 11 (1804) 383-.
- and pianos, Hawkes's, table of beats. *Farey, J. Tilloch Ph. Mg.* 37 (1811) 321-.
- — —, keyboard, new system to facilitate fingering. *Olio, G. dall'*. [1806] *Mod. S. It. Mm.* 13 (1807) 374-.
- Piano, acoustic study. *Kayser, E. Danzig Schr.* 3 (1875) (Heft 4) 17 pp.
- , iron rods to prevent warping of strings. *Presgrave, D. Beng. J. As. S.* 4 (1835) 643-.
- and organ, possibility of combining advantages. *Stoney, G. J. Dubl. S. Sc. P.* 4 (1885) 147-.
- , pedal for, Zacharia's. *Schubring, G. Halle Z. Nw.* 42 (1873) 463-.
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- , double metallic reeds for. *Imbert, A. C. R.* 112 (1891) 483-.
- , stopped, and humming tops, etc. *Smith, Herm. Nt.* 12 (1875) 145-.
- , tone making in. *Smith, Herm. Nt.* 10 (1874) 481-.
- , — — — "Gamba" pipe. *Smith, Herm. Nt.* 11 (1875) 325-.
- pitch-pipes and flageolets, ancient Mexican terra-cotta. *Cresson, H. T. Am. Ntlist.* 18 (1884) 498-.
- having propulsive mode of action. *Smith, Herm. Nt.* 13 (1876) 511-.
- reed-. *Neyreneuf, —. Caen Ac. Mm.* (1897) (Pt. 1) 3-.
- , construction and use. *Weber, W. E. Pogg. A.* 16 (1829) 193-.
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- , theory. *Weber, W. E. Pogg. A.* 17 (1829) 193-.
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- Music and declamation. *Burja, —.* *Berl. Mm. Ac.* (1803) 13-, 32-.
- Phonographic museums and archives. *Azoulay, L.* *Rv. Sc.* 13 (1900) 712-.
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- — — *Toulouse, E., & Vaschide, N.* C. R. 130 (1900) 529-.
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- — — pitch (low). *Savart, F.* A. C. 47 (1831) 69-.
- — — *Despretz, C.* C. R. 20 (1845) 1214-.
- — — *Auerbach, F.* A. Ps. C. 6 (1879) 591-.
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- — — (—). *Pauchon, E.* [1883] Mntp. Ac. Mm. 10 (1880-84) 481-; C. R. 96 (1883) 1041-.
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- — — (—). *Schaefer, K. L.* Z. Psychol. 21 (1899) 161-.
- — — (high). *Schwendt, A.* Cg. Int. Md. C. R. (1900) (Vol. 13, Otol.) 135-; Arch. Ohrh. 49 (1900) 1-.
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- fusion of tones. *Meyer, M.* Z. Psychol. 17 (1898) 401-; 18 (1898) 274-.
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- König*, R. A. Ps. C. 14 (1881) 369-.
- Stevens*, W. Le C. N. Y. Ac. T. 7 (1887-88) 238-.
- Bonnier*, P. Par. S. Bl. Mm. 52 (1900) (C. R.) 300-.
- Alteration of quality of sounds of siren. *Cagniard-Latour*, C. Par. S. Phlm. PV. (1837) 120-.
- Amplitude of sound waves. *Rayleigh*, (Lord). [1877] R. S. P. 26 (1878) 248-.
- Frequency required to produce a tone. *Auerbach*, F. A. Ps. C. 6 (1879) 591-.
- — — — —, and audibility of single sound waves. *Herroun*, E. F., & *Yeo*, G. F. R. S. P. 50 (1892) 318-.
- Helmholtz's principle. *Ferraris*, G. Tor. Ac. Sc. At. 13 (1877) 287-.
- researches. *Heidenhain*, R. [1858] Bresl. Schl. Gs. Jbr. (1859) 26-.
- Influence of phase. *König*, R. A. Ps. C. 57 (1896) 555-.
- — — *Hermann*, L. A. Ps. C. 58 (1896) 391-.
- Monge's principle. *Resal*, H. A. C. R. 79 (1874) 821-.
- Phases and quality of tone; beats and intensity. *Cross*, C. R. Am. As. P. (1884) 113-.

- Telephone and quality of tone. *Helmholtz, H. L. F. von.* Berl. Ak. Mb. (1878) 488-.
- Tone production, conditions. *Seebeck, A.* Pogg. A. 53 (1841) 417-.
- Tones produced by discontinuous impulses and by siren. *Terquem, A.* Par. Éc. Norm. A. 7 (1870) 269-; C. R. 73 (1871) 165-.
- Vowels. *Schneebeil, H.* [1878] Neuch. S. Sc. Bll. 11 (1879) 357-.
- , sung. *Pipping, H.* Z. Bl. 27 (1890) 1-, 433-.
- Reflection-tones, 2 cases. *Oppel, J. J.* [1871] A. Ps. C. 147 (1872) 369-.
- Rhythm, general theory, and experimental investigation. *Meumann, E.* Ph. Stud. 10 (1894) 249-, 393-.
- Sensations of melody. *Abraham, O., & Schaefer, K. L.* Z. Psychol. 20 (1899) 408-.
- pitch, fading. *Abraham, O.* Z. Psychol. 20 (1899) 417-.
- Sounds with dissimilar waves. *König, R.* A. Ps. C. 39 (1890) 403-.
- Synthesis of tones and theory of vowels. *König, W.* Frkf. a. M. Ps. Vr. Jbr. (1894-95) 27-.
- Theory of tones and sounds. *Barth, A.* Z. Ohrh. 17 (1887) 81-.
- Variations of frequency of musical notes in different harmonies. *Mültzer, —.* C. R. 112 (1891) 386-.
- Insects' velocity of flight, acoustic estimation. *Oppel, J. J.* (xii) Frkf. a. M. Ps. Vr. Jbr. (1860-61) 51-.
- Metals and alloys, various, comparative pitch. *Decharme, C.* J. de Ps. 6 (1877) 50-.
- Organs, ancient pitch. *Ellis, A. J.* [1878] Nt. 19 (1879) 171-.
- and orchestras. *Delezenne, —.* Lille Mm. S. (1854) 1-.
- Philharmonic pitch. *Hipkins, A. J.* Nt. 60 (1899) 421-.
- Rise of pitch from Louis XIV to present day; necessity for adopting a standard. *Lissajous, J.* Par. Bll. S. Encour. 54 (1855) 293-.
- Skating, pitch of note. *Tuer, A. W.* Nt. 39 (1889) 326.
- Tuning-fork test. *Dennert, H.* Arch. Ohrh. 43 (1897) 276-.

## STANDARDS OF PITCH.

- National standard. *Loudon, J.* [1889] Cn. R. S. P. & T. 7 (1890) (Sect. 3) 11-.
- Pitch in Boston, U.S.A. *Cross, C. R., & Miller, W. T.* Am. J. Ot. 2 (1890) 249-.
- Vienna conference for uniform pitch. *Blaserna, P.* Rm. R. Ac. Linc. Bd. 1 (1885) 795-; 2 (1886) (Sem. 1) 71-, 307-, 421-; 3 (1887) (Sem. 2) 109-.
- — — — — *Grassi-Landi, B.* Rm. N. Linc. Mm. 2 (1887) 69-.

## TUNING-FORKS.

(See also 9110.)

## 9460 Absolute Pitch. Standards of Pitch.

## ABSOLUTE PITCH.

- Rayleigh, (Lord).* [1877] Nt. 17 (1878) 12-.
- Causes determining pitch. *Savart, F.* A. C. 75 (1840) 205-.
- Determination, ancient. *Govi, G.* Nap. Rd. 25 (1886) 106-.
- by harmonium. *Rayleigh, (Lord).* Nt. 19 (1879) 275-.
- , history. *Schubring, —.* Z. Nw. 58 (1885) 292-.
- for note sung. *Hensen, V. von.* Arch. An. Pl. (Pl. Ab.) (1879) 155-.
- , stroboscopic. *Mach, E.* Wien Sb. 66 (1872) (Ab. 2) 267-.
- , —, by electromotor. *Obermayer, A. von.* Wien Sb. 63 (1871) (Ab. 2) 249-.
- by vibroscope. *Terquem, A.* C. R. 78 (1874) 125-.
- Experiments, Scheibler's. *Muncke, G. W.* Pogg. A. 29 (1833) 381-.
- Frequency, absolute, of tone, and dependence of pitch on amplitude. *Poske, F.* A. Ps. C. 152 (1874) 448-.
- , —, —, measurement. *Svanberg, A. F.* Stockh. Öfv. 6 (1849) 99-; Pogg. A. 82 (1851) 127-.
- , determination, optical, and a standard of pitch. *Chladni, E. F. F.* Gilbert A. 5 (1800) 1-.
- History. *Ellis, A. J.* Nt. 21 (1880) 550-.
- Meerens, C.* [1876] Gen. I. Nt. Bll. 22 (1877) 187-.
- Soret, J. L.* Arch. Sc. Ps. Nt. 13 (1885) 47-.
- adjustment of pitch. *Reichel, C.* (xii) Z. Instk. 3 (1883) 47-.
- comparison and standardising. *Grashof, —.* [1899] Karlsruhe Nt. Vr. Vh. 11 (1896) (Sb.) 34-.
- French "diapason normal" and König's forks. *Ellis, A. J.* Nt. 16 (1877) 85, 227; 17 (1878) 26.
- — — — — (Ellis). *König, R.* [1877] Am. Ph. S. P. 17 (1878) 80-.
- — —, Scheibler's forks, etc. *Cavallé-Coll, A.* Nt. 18 (1878) 381-.
- — —, — — —, — (Cavallé-Coll). *Ellis, A. J.* Nt. 18 (1878) 381-.
- frequency determination. *Clarke, G. S., & McLeod, H.* [1879] Phil. Trans. 171 (1880) 1-.
- — — — — *Michelson, A. A.* Am. J. Sc. 25 (1883) 61-.
- — — — — *Ellis, A. J.* Nt. 33 (1886) 54-.
- — —, absolute. *Oppolzer, T. (Ritter) von.* Wien Az. 23 (1886) 82-.
- — —, —, ancient. *Govi, G.* C. R. 51 (1860) 450-.
- — —, —, by Hipp's chronoscope. *Lang, V. von.* [1885] Wien Az. 22 (1885) 221-; Exner Rpm. 22 (1886) 129-.
- — —, —, and simple chronoscope. *Mayer, A. M.* Wash. Nat. Ac. Mm. 3 (Pt. 1) (1885) 45-, (Pt. 2) (1886) 187-.



- frequency, temperature effect. *Clarke, G. S., & McLeod, H.* [1879] *Phil. Trans.* 171 (1880) 11-.
- , —. *Kayser, H.* *A. Ps. C.* 8 (1879) 444-.
- , —. *Mercadier, E.* *C. R.* 90 (1880) 980-.
- , —. *Pierpaoli, N.* *Rm. R. Ac. Linc. Rd.* 4 (1888) (*Sem.* 1) 714-; 5 (1889) (*Sem.* 2) 265-.
- , —, and effect of electric driving. *Shearer, J. S.* *Ps. Rv.* 1 (1894) 291-.
- König's, and electric register. *Cooley, Le R. C.* *Franklin I. J.* 74 (1877) 199-.
- standard. *König, R.* *A. Ps. C.* 9 (1880) 394-.
- , frequency. *Rayleigh, (Lord), & Sidgwick, E. M. (Mrs. H.)* [1882] *Phil. Trans.* 174 (1884) 316-.
- , —, absolute determination. *Leman, A.* *Berl. Ps. Gs. Vh.* (1890) 9-, 57-.
- , Italian. *Pierpaoli, N.* *Rm. R. Ac. Linc. Mm.* 7 (1891) 200-.
- , —, temperature coefficient for. *Pierpaoli, N.* *Rm. R. Ac. Linc. Mm.* 3 (1899) 178-.
- , at Physik.-Techn. Reichsanstalt, and absolute determination of frequency. *Leman, —.* *Z. Instk.* 10 (1890) 77-, 170-, 197-.
- , Russian, frequency. *Wild, H.* [1885] *St. Pétr. Ac. Sc. Bll.* 30 (1886) 132-.
- tuning-plate as substitute for, at high pitches. *Melde, F.* *A. Ps. C.* 66 (1898) 767-.
- enharmonic, Greek. *Olio, G. dall'.* *Mod. S. It. Mm.* 10 (1803) 634-.
- , Liston's. *Farey, J.* *Tilloch Ph. Mg.* 49 (1817) 442-.
- evolution. *D., J.* *Rv. Sc.* 13 (1900) 571.
- the gekkin (Chinese musical instrument). *Du Bois, F.* *Jap. As. S. T.* 19 (1891) 369-.
- genesis. *Faa de Bruno, F.* *Les Mondes* 9 (1866) 583-.
- geometrical analogies. *Magrini, L.* *A. Sc. Lomb. Ven.* 10 (1840) 119-.
- , —. *Ritter, E.* *Gen. I. Nt. Mm.* 8 (1861-62) 43 pp.
- graphical representation, used in teaching. *Michalitschke, A.* *Lotos* 40 (1892) 11-.
- Greek music. *Münchow, K. D. von.* *Kastner Arch. Ntl.* 3 (1824) 142-.
- and harmony, mathematical theory. *Pillaut, L.* *Rv. Sc.* 35 (1885) 5-.
- , —, psychophysiological origin. *Bonnal, G.* *Rv. Sc.* 11 (1899) 560-.
- Hindoo. *Bosquet, R. H. M.* *R. S. P.* 25 (1877) 540-; 26 (1878) 372-.
- history. *Libert, J.* *Finist. S. Sc. Bll.* 9 (1887) 22-.
- , *Wead, C. K.* *Smiths. Rp.* (1900) (U. S. Ms. Rp.) 417-.
- , and mediaeval organ pipes. *Wead, C. K.* *Am. As. P.* (1899) 96-.
- Hungarian, acoustically considered. *Molnár, G.* *Mth. Termt. Éts.* 18 (1900) 87-.
- Japanese. *Knott, C. G.* *Jap. As. S. T.* 19 (1891) 373-.
- modern. *Goodwin, H.* [1867] *Camb. Ph. S. P.* 2 (1876) 64-.
- musical modes, number. *Delezenne, —.* *Lille Tr.* (1826-27) 57-.
- notation. *Loquin, A.* *Bordeaux Mm. S. Sc.* 8 (1870) lxxiii-.
- , —, new. *Patterson, R.* [1788] *Am. Ph. S. T.* 3 (1793) 139-.
- , —. *Baudrimont, A.* *Bordeaux Mm. S. Sc.* 8 (1870) xciv-.
- , —. *Tillmann, S. D.* *Am. As. P.* 19 (1870) 70-.
- natural laws of music. *Ettingshausen, A. von.* *Wien SB.* 12 (1854) 464-.
- and tempered, comparison. *Loeb, M.* *Am. As. P.* (1894) 111.
- new, Antolik's. *Kacsóh, P.* *Orv.-Termt. Éts. (Termt. Szak)* (1894) 284-.
- non-harmonic, tonometry. *Ellis, A. J., & Hipkins, A. J.* *R. S. P.* 37 (1884) 368-.

## 9470 Scales. Temperament.

## SCALES.

- Munck af Rosenschöld, P. S.* *Stockh. Öfv.* 5 (1848) 207-.
- Delezenne, —.* *Lille Mm. S.* (1855) 180-.
- Herschel, (Sir) J. F. W.* *QJ. Sc.* 5 (1868) 338-.
- Pfaundler, L.* *Steierm. Mt.* (1895) xlvi-.
- accidentals of given. *Lefebvre, P.* *C. R.* 114 (1892) 538-.
- anharmonic. *Polignac, E. de.* *C. R.* 118 (1894) 1412.
- Arabian. *Wead, C. K.* *Am. As. P.* (1899) 96.
- and chords, origin. *D., J.* *Rv. Sc.* 11 (1899) 694-.
- , —, theory. *Vincent, A. J. H.* *C. R.* 41 (1855) 808-, 1116-, 1206-.
- continuous series of tones. *Bezold, F.* [1893] *Z. Ohrh.* 25 (1894) 66-.
- diatonic. *Wildt, F. C. D.* *Oken Isis* (1833) 559-.
- , analysis. *W., C. J. (jun.)* *Franklin I. J.* 43 (1862) 175-, 232-.
- , double, and enharmonic keyboard. *Poole, H. W.* *Am. J. Sc.* 44 (1867) 1-.
- , genesis, etc. *Boutroux, L.* *Rv. Sc.* 13 (1900) 289-, 326-, 859-.
- , theory. *Beltrami, E.* *Mil. I. Lomb. Rd.* 15 (1882) 61-.
- enharmonic. *Bertha, A. de.* *C. R.* 118 (1894) 1137-; 119 (1894) 56.

## NUMERICAL EVALUATION.

- Delezenne, —.* *Lille Tr.* (1826-27) 1-.
- Chamousset, —.* (vi *Adds.*) *Majocchi A. Fis. C.* 24 (1846) 106-; (i) *At. Sc. It.* (1847) 264-.
- Györy, S.* (xii) *Mag. Ak. Éts.* (1853) 203-.
- Berthaud, —.* [1867] (xii) *Doubs S. Mm.* 3 (1868) 41-.
- Matzka, W.* *Prag Ab.* 11 (1882) (*Mth.*) (No. 7) 31 pp.
- Thomson, J. H.* *Dubl. S. Sc. P.* 4 (1885) 152-.
- calculation. *Györy, S.* (xii) *Mag. Ak. Éts.* (1856) 217-; (1857) 28-.

- calculation. *Schubring, G.* Halle Z. Nw. 27 (1866) 485-; Z. Mth. Ps. 13 (1868) (Suppl.) 105-.
- *Matzka, W.* Prag Ab. 2 (1888) No. 6, 19 pp.
- *Berdellé, C.* As. Fr. C. R. (1897) (Pt. 2) 198-.
- of chromatic scale. *Delbauf, J.* Brux. Ac. Bll. 21 (1866) 339-.
- by dividing fundamental by 8 and 9. *Hirzel, H.* Am. As. P. (1850) 376-.
- intervals, chromatic (as sung). *Bidault, —.* C. R. 90 (1875) 1599-.
- , diatonic, and consonances. *Schlegel, V.* Z. Mth. Ps. 18 (1873) 203-.
- , logarithmic. *Munck af Rosenschöld, P. S.* Lund Phys. Sällsk. Ts. 1 (1837) 19-.
- sharps and flats, rule for values. *Girault, —.* Rouen Tr. Ac. (1850-51) 69-.
- origin. *Wallaschek, R.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 905-.
- pentatonic, etc., in Scottish music. *Neaves, —.* [1871] Edinb. R. S. P. 7 (1872) 382-.
- perfect, on fixed-tone instruments. *Ellis, A. J.* R. S. P. 13 (1864) 93-.
- and prismatic spectrum. *Huston, D.* Thomson A. Ph. 4 (1814) 254-.
- Pythagorean Comma. *Zoch, I. B.* Carl Rpm. 18 (1882) 748-.
- Ré. *Delezenne, —.* Lille Mm. S. (1851) 1-.
- *Herlin, T.* (xii) Lille S. Mm. 5 (1868) 885-.
- and teaching of physics. *Mathias, —.* Toul. Ac. Sc. Bll. 1 (1898) 254-.
- tempered, chemical analogies. *Doolittle, M. H.* Smiths. Misc. Col. 33 (1898) Art. 2, 27- (Wash. Ph. S. Bll. 7 (1885).)
- theoretical. *Chicandard, G.* As. Fr. C. R. (1891) (Pt. 2) 301-.
- deduction. *Chicandard, G.* As. Fr. C. R. (1897) (Pt. 2) 248-.
- theory. *Vincent, A. J. H.* Par. S. Phlm. PV. (1888) 89-, 101-.
- *Ritter, Élie.* Arch. Sc. Ps. Nt. 26 (1866) 69-.
- *Rozé, C.* Les Mondes 10 (1866) 705-.
- *Robin, P.* Par. S. Ps. 86. (1866) 15-.
- and calculation. *Schubring, G.* Halle Z. Nw. 82 (1868) 65-, 415-.
- , geometric. *Michel, C.* Les Mondes 10 (1866) 564-; 11 (1866) 54-.
- tone system, new. *Munck af Rosenschöld, P. S.* Stookh. Ak. Hndl. (1847) 1-.
- transposing dial. *Henry, L. d'.* [1861] (xii) Lille S. Mm. 9 (1863) 188-.
- transposition of music. *Delezenne, —.* Lille Mm. S. (1853) 24-.
- Equal temperament. *Farey, J.* Tilloch Ph. Mg. 28 (1807) 65-; 49 (1817) 360-.
- *Clarke, C. B.* Nt. 27 (1863) 240.
- *Cross, C. R.* Am. Ac. P. 21 (1886) 499-.
- , and effect of key. *Stoney, G. J.* Dubl. S. Sc. P. 4 (1885) 59-.
- , major and minor modes in. *Ricard, F.* C. R. 90 (1880) 1547-.
- Instrument for control of tuning other than equitempered. *Bosanquet, R. H. M.* R. S. P. 21 (1873) 131-.
- Instruments with fixed tones. *Ellis, A. J.* R. S. P. 13 (1864) 404-.
- , keyed. *Hawkes, W.* Tilloch Ph. Mg. 28 (1807) 304-.
- Intonation, improvements. *Ellis, A. J.* Nt. 15 (1877) 475-.
- , just. *Bosanquet, R. H. M.* R. S. P. 21 (1873) 131-.
- , —. *Clarke, (Col.) A. R.* Nt. 15 (1877) 159-, 253, 353-.
- , —, etc. *Chappell, W.* Nt. 15 (1877) 196-, 291-, 430.
- , —. *Poole, H. W.* Am. J. Sc. 15 (1873) 359-.
- , —, in instruments with fixed tones. *Ellis, A. J.* [1874] R. S. P. 23 (1875) 3-.
- , perfect. *Poole, H. W.* Silliman J. 9 (1850) 68-, 199-.
- and temperament. *Holton, J. F.* N. Y. A. Lyceum 4 (1840) 505-.
- , true, illustrated by voice-harmonium. *Brown, C. B. A. Rp.* (1876) (Sect.) 46-.
- Monochord with spiral bridges for representation of all intervals. *Michalitschke, A.* Lotos 42 (1894) 33-.
- Musical intervals, measurement on spiral projection. *Tillmann, S. D.* Am. As. P. 16 (1867) 27-.
- Piano system of constant harmony. *Laborde, —.* Par. Bll. S. Encour. 50 (1851) 146-.
- Pitch determination and temperament. *Drobisch, M. W.* [1852] Leip. Ab. Mth. Ps. 2 (1855) 1-; 3 (1857) 1-.
- and temperament. *Schubring, G.* Halle Z. Nw. 38 (1871) 258-.
- *Drobisch, M. W.* Leip. Mth. Ps. B. 29 (1877) 1-.
- Scientific determination. *Drobisch, M. W.* Pogg. A. 90 (1853) 353-.
- Sonometer, equable, experiments with. *Astolfi, (Prof.) O.* Rm. At. N. Linc. 24 (1871) 287-.
- , organ pipe. *Stevens, W. Le C.* Franklin I. J. 84 (1882) 34-.
- for tuning instruments with fixed tones. *Magrini, L.* Mil. At. I. Lomb. 1 (1858) 386-.
- Systems. *Bosanquet, R. H. M.* [1874] R. S. P. 23 (1875) 390-.
- Tagliavini's doctrine. *Schiassi, P.* Bologna N. Cm. 2 (1836) 20-.
- Theorems. *Farey, J.* Tilloch Ph. Mg. 36 (1810) 39-, 374-; 38 (1811) 434-.
- Tonometry, new system. *Luca, P. A. de.* [1842] Nap. At. Ao. 5 (1843) (pte. 2) 323-.
- Tuning, Armellino's method. *Györy, S.* (xii) Mag. Ak. Éts. (1859) (Suppl., Mth. Term.) 136-.

## TEMPERAMENT.

- Fisher, A. M.* Silliman J. 1 (1818) 9-, 176-.
- Hansteen, C.* Mg. Nvtd. 8 (1828) 45-.
- Helmholtz, H.* Heidel. Vh. Nt. Md. (1859-60) 73-.
- Derffel, J.* A. Ps. C. 184 (1868) 298-.
- Bosanquet, R. H. M.* Ph. Mg. 48 (1874) 507-; 50 (1875) 164-.

- Tuning, experiment, explanation. *Merrick, A.* Tilloch Ph. Mg. 37 (1811) 358-.
- guitar without use of ear. *Bary, É.* L'I. 3 (1835) 167-.
- instruments with fixed tones. *Stanhope, C.* (*Earl of*). Tilloch Ph. Mg. 25 (1806) 291-.
- — — — — *Farey, J.* Tilloch Ph. Mg. 26 (1806) 171-.
- — — — — (*Stanhope*). *Farey, J.* Tilloch Ph. Mg. 27 (1807) 191-; 28 (1807) 140-.
- — — — — *Farey, J.* Tilloch Ph. Mg. 27 (1807) 313-.
- — — — — (*Farey*). *Stanhope, C.* (*Earl of*). Tilloch Ph. Mg. 28 (1807) 143-.
- — — — — *Farey, J.* Tilloch Ph. Mg. 29 (1807) 345-; 30 (1808) 8-.
- — — — — (*Callcott's pamphlet*) (*Farey*). *Stanhope, C.* (*Earl of*). Tilloch Ph. Mg. 30 (1808) 34-.
- — — — — (*Stanhope*). *Farey, J.* Tilloch Ph. Mg. 33 (1809) 292-.
- , Kirnberger's and isotonic systems, table of beats in. *Smyth, C. J.* Tilloch Ph. Mg. 35 (1810) 448-; 36 (1810) 435-.
- — — — — (*Smyth*). *Merrick, A.* Tilloch Ph. Mg. 37 (1811) 111-.
- Fluids, acoustic phenomena in. *Kayser, R.* [1899-1900] Z. Ohrh. 37 (1900) 217-.
- Fusion of sounds. *Bolton, T. L.* Am. J. Psychol. 5 (1898) 294-.
- Intensity, recognition of differences in. *Angell, F.* Ph. Stud. 7 (1892) 414-.
- Perception of direction of sound source. *Gough, J.* [1801] Manch. Ph. S. Mm. 5 (1802) 622-.
- — — — — *Purkyně, J. E.* (viii) D. Nf. B. 37 (1862) 222-.
- — — — — *Rayleigh, (Lord).* Nt. 14 (1876) 32-; Ph. Mg. 3 (1877) 456-.
- — — — — *Gray, A. A.* Edinb. R. S. P. 21 (1897) 443-.
- — — — — sounds. *Dowden, R.* NH. Rv. 2 (1855) (P.) 29-.
- — — — — *Brücke, E.* [1884] Wien Ak. Sb. 90 (1885) (Ab. 3) 199-.
- — — — — *Hensen, V.* Arch. Ohrh. 23 (1886) 69-.
- — — — — *Kessel, —.* D. Nf. Tbl. (1887) 330.
- — — — — *Le Conte, J.* Science 10 (1887) 312.
- — — — — (theory). *Hermann, —.* Königsb. Schr. 35 (1895) [3]-.
- — — — — *Dennert, H.* Arch. Ohrh. 41 (1896) 109-.
- — — — — (very short). *Abraham, O., & Brühl, L. J.* Z. Psychol. 18 (1898) 177-.
- — — — — of least intensity, peculiarity. *Urbantschitsch, V.* (xii) Cb. Md. Ws. 13 (1875) 625-.
- Physics and æsthetics, inter-relationships. *Soret, J. L.* Sch. Nf. Gs. Vh. (1885-86) 1-.
- Pitch, influence of intensity on. *Broca, A.* C. R. 124 (1897) 1512-; Par. S. Bl. Mm. 49 (1897) (C. R.) 652-.
- — — — — *Bonnier, P.* Par. S. Bl. Mm. 49 (1897) (C. R.) 678-.
- , variation, least perceptible. *Scripture, E. W.* Am. J. Psychol. 4 (1892) 579-.
- , —, perception. *Stern, L. W.* Z. Psychol. 11 (1896) 1-; 21 (1899) 360-; 22 (1900) 1-.
- , —, sensibility to. *Luft, E.* Ph. Stud. 4 (1888) 511-.
- , —, — small. *Meyer, M.* Z. Psychol. 16 (1898) 352-.
- Sensation of musical intervals. *Schischmánow, I.* Ph. Stud. 5 (1889) 558-.
- — — — — *Stumpf, C.* Z. Psychol. 1 (1890) 419-; 2 (1891) 266-, 426, 438-.
- — — — — *Engel, G.* Z. Psychol. 2 (1891) 361-.
- — — — — *Lorenz, C.* Ph. Stud. 6 (1891) 26-.
- — — — — (*Stumpf*). *Wundt, W.* Ph. Stud. 6 (1891) 605-; 7 (1892) 298-, 633-.
- Sensations of tone. *Müller, J. J.* Leip. Arb. Pl. Anst. (1871) 1-.
- — — — — analysis. *Mach, E.* Wien Ak. Sb. 92 (1886) (Ab. 2) 1283-.
- — — — — fusion. *Buch, E.* Ph. Stud. 15 (1900) 1-, 183-.
- — — — — Helmholtz's theory. *Moos, S.* Virch. Arch. 31 (1864) 125-.
- Similar simultaneous note on various instruments, intensity of sensation. *Kool, C. J.* Laus. S. Vd. Bl. 31 (1895) xxiii-.

## PHYSIOLOGICAL ACOUSTICS.

(See also Physiology 2753, 4141, 3500-3590.)

## 9500 General.

(See also 9430.)

- Mayer, A. M.* Ph. Mg. 48 (1874) 266-, 371-, 445-, 513-; Am. J. Sc. 8 (1874) 241-; 9 (1875) 267-; 12 (1876) 329-; 47 (1894) 1-, 184.
- Audition, experiments. *Wheatstone, (Sir) C.* Q. J. Sc. (1827) (Pt. 2) 67-.
- Auditory acuity. *Levy, —.* D. Nf. Vh. (1898) (Th. 2, Hälfte 2) 251-.
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